

Final Draft

USAID/India Agricultural Strategy

November 19, 2001

Executive Summary

USAID/India Agricultural Strategy

The reason why India should increase its support for agricultural development is clear: Reinvigorating agricultural growth is necessary for India to achieve higher overall economic growth and to reduce poverty and food insecurity.

The reasons why USAID/India should re-engage in support for India are four-fold:

- It is to our advantage – for humanitarian, economic, and political reasons – for India to succeed.
- The timing is propitious -- important changes in the course of agricultural policies and technology development are imminent. The challenge is to do them and to make these changes right.
- India wants us to re-enter the agricultural sector. Many key Indian policy-makers and scientists have been trained in the U.S. and understand the immense benefit from interacting with U.S. scientists, analysts, and business people.
- The U.S. has some unique things to contribute. Our capabilities in economic policy analysis are recognized and appreciated. We have an outstanding system of agricultural science, including a history of successfully collaborating with India, particularly during the early stages of the Green Revolution. We are the major source of knowledge on biotechnology. We are pre-imminent in agribusiness expertise. And we are appreciated for our abilities to support Indian professionals to champion constructive change.

There are various explanations why USAID/India left the agricultural sector (a trend that was developing well before sanctions). There is a clear and compelling argument for us to re-engage in the agricultural sector.

Probably more than a lack of financial resources, our need to develop a clear understanding of agriculture's role in India's broader economic development and structural transformation will constrain our re-engagement over the short term. Accepting this conclusion lends weight to the proposition that the Mission should start small, probably by bridging into agriculture from an activity or two in its current portfolio. Then, at a speed commensurate with the growth of its internal capabilities, over the next 24 to 36 months it may add a new stand-alone activity. We have separated the potential activities into two tiers.

First-Tier

If USAID wants to get the most potential impact from the least money and wants to get started promptly, it might focus initially on supporting **Food and Agricultural Policy** changes. This is a high-return, but also high-risk venture. It would have the huge advantage of complementing PL 480 Title II activities by facilitating the reemergence of a private marketing system and, better targeting of subsidized programs. Both would

benefit producers and consumers. Such an investment could be considered as the first step of an eventual exit strategy.

Close behind might be support for **Biotechnology**, arguably politically sensitive but very important for infusing improved technologies to fuel increased agricultural productivity and improved nutrition. There is little competition from other donors.

Second -Tier

Support for mutually beneficial **Scientific Exchanges** (with or without PL 480 funding support) could be activated fairly easily. The support for scientific exchanges might be a bridge to broaden support for the state agricultural universities, which would take a bit longer to design and activate.

Policy support for facilitating **Agricultural Market Reform** would not be big-ticket and also could be designed rather promptly. India agribusiness has identified this area as a high priority.

Improved On-farm Water Management would be a bigger investment. It would also have a longer design period. It and **Irrigation Power Pricing Reforms** are closely related to and could benefit from close collaboration with programs of and perhaps supervision from the Mission's Environment, Energy, and Enterprise Office.

Support for Rural Access to Information Communication Technology is closely related to and could benefit from close collaboration with programs of and perhaps supervision from the Program Development and Economic Growth Office. The value USAID could add is to help in hastening the process through an infusion of funds and cutting-edge technology, providing content and direction that specifically addresses the rural poor, and providing coverage to areas that may be overlooked.

State Agricultural Universities and **Horticultural Markets Development** are both larger ticket activities and might require extensive design time.

Water Markets; Inter-State Water Rights is a high risk/high return venture.

We believe it is quite feasible to move thinking along considerably – to test potential and add details – of several of these proposed activities, particularly Food and Agriculture Policies and Biotechnology, even before the Mission strategy is submitted for AID/W review. Certainly it is feasible (of course, assuming GOI concurrence) to have the first-tier projects ready to go by the start of the next fiscal year.

USAID/India Agricultural Strategy

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USAID/India Agricultural Strategy

Introduction

The USAID Mission in New Delhi is preparing a new, comprehensive investment strategy for the period FY03 through FY08. As part of this, the Mission is considering whether and, if so, how it should reengage in the agricultural sector. The purpose of this paper is to initiate discussion by providing some background, examining certain options, proposing a way forward, and soliciting comments from concerned parties inside and outside the Agency. By sharing, revising, iterating, and eventually finalizing its contents in November of 2001, the Mission should be able to divine its future direction in agriculture by early December.

The rural economy provides employment to roughly seven out of ten Indians in the labor force, and agriculture is the main source of rural employment (75 percent) and income (70) percent (1994). Primary agricultural production's share of GDP has fallen from 29 to 24 percent over the past decade, partly the result of more rapid growth in manufacturing and services facilitated by India's reforms of the early 1990's and partly a slowing of growth in the rural economy. Accelerated agricultural growth is needed if agriculture is to fulfill its continuing key roles in India's broader structural transformation: (1) producing food (wage goods) to feed the population; (2) generating employment and income to provide markets for goods and services produced by the agricultural and non-farm/urban economy; and (3) serving as the social safety net, providing jobs and income for landless laborers and marginal farmers. It is desirable that the accelerated agricultural growth lowers food prices through increased productivity and decreased transactions costs, extends throughout the country and does not degrade the natural resource base. There is more than a little concern that inappropriate policies and, subsequently, inadequate investment in agriculture, together with poor human development, pose the most serious long-term constraints on India's growth and its efforts to reduce poverty and food insecurity.

A basic premise is that USAID should approach assistance to India's agriculture sector with humility. While it's true that USAID accomplished wonderful things in agriculture nearly two generations ago, we have not been engaged recently and our aspirations for re-engagement must be carefully sequenced, lest they promote expectations beyond what can be delivered, that exceed our ability to re-staff and, more importantly, that extend beyond our understanding of what is happening in India.

This paper does not attempt a comprehensive analysis of the sector. That is just too huge of an undertaking, and it may not even be appropriate. Rather, to set the scene, a short retrospective of the past thirty years of Indian agriculture is provided in Section I. Next, Section II summarizes the principal factors perceived to be constraining agricultural growth and the sector's ability to alleviate poverty. It also describes which institutions are currently involved in treating these issues. Section III responds to the question, "Why should USAID re-engage in agriculture in India?" To begin focusing on what USAID might be able to do, Section IV identifies USAID/India's general objectives in re-

entering the agricultural sector. Section V describes the principal parameters constraining the Mission's response. Section VI identifies the selection or design criteria which will be used to select and shape the Mission's re-entry response. Section VII identifies a set of potential interventions drawn from discussions within the Mission and Washington and from a survey of broader U.S. and Indian institutional interests. Section VIII sifts through these opportunities, using the selection/design criteria, to identify the Mission's best bets. Section IX provides additional organizational and operational details regarding next steps in elaborating and implementing these best bets. Finally, Section X provides a results framework for the use by USAID program planners.

I. What's Been Happening? A Quick Review of Sector Performance

India's agricultural growth rate—2 percent in the 1970's—increased by half to 3 percent in the next decade, not only outpacing the rate of population growth for the first time since Independence but also bringing an unprecedented reduction in rural poverty and food insecurity. With growth spreading to rainfed regions and to the heavily populated Eastern states that had previously lagged behind, India's farmers turned in a remarkable performance, diversifying into the production of non-food grains, especially oilseeds and livestock products, particularly dairy and poultry. Adopting high-yielding technologies that proved as effective on small holdings as on large, growers throughout the country fueled an agricultural expansion more broad-based and labor-intensive than ever before. Higher on-farm productivity in almost all regions, increased demand for rural labor both on and off the farm. Rising real wages reflected a tightening of the rural labor markets and combined with a decline in real food prices to lower poverty rates in the country side.

Higher productivity was the major force behind the last decade's significant acceleration of agricultural growth. It took the form of higher yields for almost all crops, notably non-food grains, and higher cropping intensities. These gains in productivity were made possible by the diffusion of technology across crops and regions, a diffusion much broader and deeper than during the early phase of the Green Revolution. Technological change, which is estimated to have contributed one-third to one-half of output growth, more than compensated farmers for the decline in agricultural prices, prompting them to invest and use more modern inputs.

Strong empirical evidence demonstrates that improved policies, increased expenditures on agricultural technology, irrigation, rural infrastructure (roads, markets, electrification) and human development (education) all played substantial roles in speeding this technological change and raising agricultural output. Directly and indirectly, they encouraged private investments and the use of modern inputs that spurred growth with consequent reductions in rural poverty. These expenditures also contributed to rural poverty reduction by encouraging the development of the non-farm economy and its off-farm employment opportunities that exerted upward pressure on rural wages.

Defying conventional wisdom, in July 1991 Indian leaders decided to discard forty years of failed socialistic policies. Their bold economic reform agenda sought to restore macro-economic stability, liberalize the domestic economy, and integrate India with the

global economy. Considerable progress has been made, especially in the industrial sector. The consensus is that India has embarked on a fundamental and irreversible restructuring of its economy that could result in accelerated broad-based economic growth and the alleviation of the world's greatest concentration of poverty.

However, the agricultural sector, which, based on the momentum from the Green Revolution, had been carrying the economy in the past, now promises to be a drag on a higher level of growth unless reforms are extended to this sector that still accounts for a quarter of GDP and two-third's of the labor force. Reforms of the agricultural sector therefore hold the key to further progress on reducing Indian poverty.

The 1990's brought a marked change to Indian agriculture. For while the decade witnessed little change in trend of agricultural growth performance, the growth experienced was been much less poverty-alleviating than in the 1980's. In fact, there is no strong evidence that the incidence of rural poverty has declined since 1993/94. This is partly because higher prices for basic food staples (rice and wheat), while stimulating agricultural growth, have hurt the poor. Furthermore, the growth has been less well distributed across regions. The overall 3.1 percent annual growth rate between 1991/92 and 1997/98 masks wide regional variations. Agricultural performance is improving in the western and southern states, as well as in the central state of Madhya Pradesh. By contrast, growth is slowing in Punjab and Haryana and to a lesser extent in West Bengal, historically leading performers. Growth is also slowing in the Eastern states and Uttar Pradesh, regions where rural poverty is concentrated.

In part this reflects the fact that India has already realized much of the growth potential inherent in the Green Revolution's high yielding varieties and the country's irrigation potential. Many are asking "Where are the future sources of growth in agriculture?" Certainly some gains in the area of food grains could result from improved storage, handling and processing which would reduce post-harvest losses. Others speak of gains from diversification into higher value products like cut flowers for Bombay and poultry for Bangalore. Meanwhile, discussion regarding the potential role for genetically modified organisms (GMO's) in addressing India's nutritional and caloric shortfalls is underway but could benefit from more rigorous analysis and less emotion.

On a final note, relatively slow growth in Indian agriculture as a whole has not deterred the growth of public food grain stocks purchased and stored by the Food Corporation of India (FCI). When such stocks approached 40 million metric tons in June 2000, the cost of the system, in the form of financial losses incurred through the GOI's food subsidy bill, rocketed. This subsidy is essentially required to finance the public distribution system's large physical losses, huge inventories, and the continuing pursuit of supporting farm-gate prices. With stocks now expected to approach 80 million tons by the close of November 2001, it must be asked whether there are more cost efficient means of ensuring India's national level food security.

A household level, food security remains an illusive concept for one-quarter of India's population. Despite record levels of stocks at the national level, 250 million Indians

receive less than their caloric requirements. Attempting to explain away such hunger as a simple effective demand problem (“they will have enough to eat when their incomes improve”) ignores the obvious opportunities inherent in finding ways to improve the effectiveness of the country’s targeted food assistance programs or reducing the broad marketing margin between the farm-gate and consuming households.

So, in sum, agriculture is still India’s major employer, but over the longer-term the future sources of growth in Indian agriculture are uncertain and likely to be more diverse than during the hay days of the Green Revolution. Over the long-term, growth and productivity in the sector must be increased, or slowing agricultural production could prove a drag on India’s broader economic development. Meanwhile, over the short-term one is confronted with the conundrum that despite record food grain surpluses, India’s chronic malnutrition shows few signs of improvement.

II. What are the Issues?

Remarkable though India’s agricultural growth performance has been—3 percent per year over 20 years—the increase still falls below the 4.5 percent target set for the Ninth Plan (1997-2002). While the sector has the potential to meet and sustain the planned rate, structural problems are making it increasingly difficult for agriculture and the non-farm economy to maintain even its historical growth levels, let alone play a significant role in successfully reducing rural poverty. Clearly there is a need to move in new directions for new gains, to adjust to the new challenges and opportunities of the new millennium. Several explanations have been offered for the less optimistic performance of the agricultural sector.

Markets that don’t work very well or not at all. Analysis of the performance of agricultural markets and agro-industry in handling India’s major commodities (rice and wheat, sugarcane, oilseeds, cotton, dairy products) points to gross inefficiencies at all stages. In addition to inadequate infrastructure, over-regulated markets and agro-industry and large, direct, government interventions on rice, wheat, and sugar markets where an efficient private sector (including independent cooperatives) could operate, breed these pervasive inefficiencies and the needlessly large margins in marketing and processing that curb the competitiveness of agriculture and its agro-industry.

As mentioned above a case in point is rice and wheat. These two commodities account for about 26 percent of agricultural GDP, 40 percent of gross cultivated area, and over 75 percent of all food grain output. These staples are vital for household food security, as they constitute a major source of calories, especially for the over 300 million poor. They account on average for 30 percent of rural and 20 percent of urban food expenditures. The markets for these two commodities are dominated by the FCI which procures and, through the Targeted Public Distribution System (TPDS), sells most, sometimes all, of India’s marketed rice and wheat. GOI food grain marketing policies that stunt private trade are discouraging much needed modernization. Market congestion, high handling and storage losses, high transport costs and low milling recovery rates all reflect a marketing and milling infrastructure in great need of improved technology and

infrastructure. Shut out of many markets and faced with unpredictable and unrewarding limits on their marketing margins, private traders gain little from higher efficiency and are unlikely to invest in much needed up-grading. High as the costs of doing business are for private traders, the GOI pricing policy is even more expensive. Subsidizing the public distribution system swells fiscal deficits, and FCI's technical and managerial shortcomings drive up its operational expenses and the cost of attendant subsidies.

Inadequately targeted safety net spending. Since independence India has sought to reduce rural poverty by supplementing the trickle-down effects of rural growth through anti-poverty programs. There are essentially four approaches — public works, self-employment through subsidized credit, social welfare and nutrition intervention. Benefit incidence studies demonstrate across the board that non-poor have been able to capture a significant share of these anti-poverty resources, and this have prompted the GOI to look at options for better targeting. In 1997 the TPDS emerged in an effort to retarget what had become come-one, come-all rice and wheat subsidies. In some states, communities or beneficiary groups are being involved in identifying the poor and monitoring ration shops to shore up TPDS effectiveness. Early evidence from village studies in eastern Uttar Pradesh and Bihar suggested that TPDS targeting measures may have increased the amount of subsidized food grains reaching the poor. However the same studies suggests that as much as 40 percent of the rice and wheat is still being diverted.

Subsidies crowding out productive public investments. India's rural economy does not suffer from a dearth of public financial support. On the contrary, central and state governments spend close to 23 percent of agricultural GDP (or 6 percent of total GDP) on agriculture and rural development. This is a higher percentage than any other Asian country (including China), except for South Korea and Thailand. And yet rural poverty reduction has been slower than in other Asian economies. The problem appears not to lie in how much is spent, as it does in how well it is spent.

In an effort to curtail heavy fiscal deficits, policy makers over the past decade chose to sacrifice the productive, high levels of investment in technology, rural infrastructure (roads and irrigation) and human development in order to maintain popular but poorly-targeted subsidies. These subsidies on irrigation and power provided by state governments and fertilizer and food provided by the central government now represent close to half of all public spending for agriculture. They dominate governmental interventions in rural India, are growing (4 percent per annum in real terms since 1991), and have undermined the aforementioned growth enhancing expenditures. For example, expenditures on the most productivity-enhancing agricultural technology research and dissemination are being squeezed-out when, by international standards, they already lag behind. At the state level, major investments in economic infrastructure (e.g. roads and transport), as well as capital investments and current spending for human capital — education and health — have been dropped or delayed. This has aggravated the unevenness of rural growth and limited progress on poverty reduction.

Under-investment in technology development and human capacity development. If rapid, labor intensive rural growth is to shrink poverty and raise living standards, the poor must

be better served in basic education and health care. In India and all over the developing world, quality education has proven to be among the most effective weapon against poverty, significantly more productive in the long run than various anti-poverty programs. To take advantage of new educational opportunities, however, the poor also need better health, a gain best achieved by focusing public spending on activities of direct benefit to the poor: attacking primarily communicable diseases and widening access to higher-quality sanitation and water services.

Some have suggested that the system of state agricultural universities supported previously by USAID in collaboration with major U.S. land-grant universities, that made such vital contributions to the Green Revolution, has not prospered in recent years. In particular, faculty recruitment has become very in-grown, funding for research has been very limited, opportunities for international exchanges have been greatly reduced, and library purchases have been curtailed. The result has been a high cost to both human capacity building and to agricultural research contributions.

Degrading natural resource base. It is glaringly apparent that sustainability of the agricultural resource base is becoming a primary concern for India's future economic growth and food security. For if the resource base cannot be sustained, neither can agricultural growth and the vicious hold of poverty over the masses will continue, if not worsen. Thus poverty, economic growth, and sustainability of the natural resource base are inextricably linked issues for the foreseeable future. Water is perhaps the major limiting factor for future agricultural growth but soils, etc. also pose significant challenges.

Reduced donor support. Donors across the board have reduced support for Indian agriculture.¹ Practically the only donor with a major program of agricultural support is the World Bank. Under its rural development portfolio, the World Bank is supporting irrigation, watershed development, and drinking water projects in key reform states and has an ongoing National Agricultural Technology Project with the Indian Council of Agricultural research (ICAR). It also supports the Integrated Child Development Services Scheme (ICDS) in Andhra Pradesh, Orissa, Madhya Pradesh, Bihar, Uttar Pradesh, Tamil Nadu, Kerala, Maharashtra, and Rajasthan with a total of \$600 million, including a national training component. At the request of the GOI, the World Bank conducted a food security analysis. However, no follow-up action or program based on the recommendations of this study have yet emerged.

The World Food Program (WFP) provides food assistance valued at about \$12 million to the ICDS and has on-going forestry and food for work (FFW) projects (about \$12.5 million). WFP, now developing its new country strategy, will continue to work with ICDS but is considering adopting a more holistic approach to food security that includes education, rural development, etc. UNICEF assists the GOI in the ICDS nationally as well as in micro-nutrient programs. They have taken the lead in the salt iodization program in the country.

¹ This description of donor support is borrowed in large part from “*Sector Profile – Food Security in India*” by Ashi Kohli Kathuria.

Historically, USAID has provided large support to Indian agricultural development, in the early phases building fertilizer plants, supporting rural electrification, and providing large support to state agricultural universities and agricultural research and extension and more recently to agribusiness development. That support dwindled over time and was completely phased out (because of sanctions) in 1998. USAID has been providing food assistance through the CARE and Catholic Relief Services (CRS) programs for the past fifty years, contributing to the food security of the most food-insecure populations. The major part of this \$90 million a year program is supporting ICDS through CARE's Integrated Nutrition and Health Program (INHP). The Title II food aid program has concentrated on providing food to children and pregnant and nursing mothers largely among the most deprived sections like tribals and women and children and also in the most underdeveloped states. Thus, it has made a significant contribution by enabling several state governments to expand ICDS and to improve its effectiveness, quality, and coverage.

III. Why Should USAID Re-engage in Agriculture in India?

The reason why India should increase its support for agricultural development is clear: Increased agricultural growth is necessary for India to achieve higher overall economic growth and to reduce poverty and food insecurity.

The reasons why USAID/India should re-engage in support for India are four-fold:

- It is to our advantage – for humanitarian, economic, and political reasons – for India to succeed.
- The timing is propitious -- important changes in the course of agricultural policies and technology development are imminent. The challenge is to do them and to do these changes right.
- India wants us to re-enter the agricultural sector. Many key Indian policy-makers and scientists have been trained in the U.S. and understand the immense benefit from interacting with U.S. scientists, analysts, and business people.
- The U.S. has some unique things to contribute. Our capabilities in economic policy analysis are recognized and appreciated. We have an outstanding system of agricultural science, including a history of successfully collaborating with India, particularly during the early stages of the Green Revolution. We are the major source of knowledge on biotechnology. We are pre-imminent in agribusiness expertise. And we are appreciated for our abilities to support Indian professionals to champion constructive change.

IV. USAID/India Objectives in the Agricultural Sector

The USAID/India agricultural sector strategy will respond to the general objectives identified in the overall mission strategy. We are assuming that alleviation of poverty and food insecurity will figure prominently among these mission objectives. We also

assume that environmental, energy, and nutritional concerns will be reflected in the mission objectives.

Additional specific objectives for the agricultural sector strategy include the following.

Learning Opportunity as USAID/India Re-enters the Agricultural Sector. Lacking an agricultural presence, USAID has lost its ongoing communication with the Indian agricultural community and must retool if it is to become a significant collaborative player in the future.

Achieve a Fundamental/Systemic Change that Accelerates and Sustains Rural Economic Growth, Employment or Food Security. The question that must be asked on USAID interventions, especially in the initial phases of re-entry, is “is it worth doing?” We need to pick our spots where we have competitive advantage and are likely to make a difference.

Opportunity to “Transform” Relationship — the Developmental aspect of the Overarching U.S.-Indian Bilateral. Our main contribution will not be in amount of funding, but in quality of technical collaboration. So we need to seek out new private and public partners and new ways of doing business whenever possible to leverage our impact.

V. Parameters Constraining USAID/India’s Response

Indicative parameters that will constrain USAID response in the agricultural sector would include the following.

Five-year horizon in which to achieve demonstrable, material progress. The parameters guidance from Washington directed that the mission strategy, at least initially, be cast in a five-year horizon, albeit within a 15-year overall time-frame.

No more than \$2 million per year. This is a notional DA figure for planning purposes. We are assuming that the figure could be higher if 1) PL 480 funding is made available for the proposed scientific exchanges, 2) we can come up with some attractive GDA possibilities, and 3) we make a particularly compelling case. We propose to suggest our best recommendation at the \$2 million funding level but also suggest attractive potential options for higher funding levels.

USAID’s knowledge of and contacts within India’s agricultural sector have grown cold. Since the closure of its last agricultural project in 1998, the Mission’s contacts with the sector have grown cold. But more importantly, even prior to that the Mission’s profile in the sector and its in-house expertise and knowledge level had severely attenuated. It’s true that agriculture filled the Mission’s portfolio during the decade following the Agency’s return to India in 1978. For ten years the Mission obligated an average (in current terms) of \$57 million each year to agricultural projects, and by 1987 agriculture accounted for 70 percent of the Mission’s entire Development Assistance portfolio. However, these levels began to fall precipitously during the mid-1980’s, and

during the subsequent twelve year period (FY88 through FY98) the Mission's net obligations in agriculture averaged only \$400,000 per year. The point is that USAID has not been much of a player in Indian agriculture for some time. Our current capability to follow and interpret developments in the sector is severely limited.

Nevertheless, certain Mission programs bump up against agricultural and rural economic issues on a more regular basis. The long-standing Title II program is a major case in point. Moreover, through second parties the Agency has maintained some small activities in the sector. Building upon these existing platforms, where Mission interests and capabilities already exist, may represent the easiest way forward.

USDA export concerns. The USDA has signaled that it would not encourage USAID provide support for commodities that might compete with actual or potential U.S. exports – particularly poultry, maize, wheat, soybeans, and oilseeds.

USAID staffing. Presently USAID/India has limited staffing with specific agricultural responsibilities (fortunately the RUDO Deputy Director has agricultural expertise) and does not, to our information, presently project an agricultural position in its staffing plan.

VI. Selection/Design Criteria for Ranking Potential USAID Interventions

There are a sufficient number of ideas about what USAID should be doing in agriculture and enough entrenched interests that a transparent method is required for recounting which ideas were considered seriously, how they were ranked, and why the final “best bets” were selected. After understanding what USAID/India's objectives are and the constraints that bind its course of action, the next step is to identify what factors will be used to analyze and eventually rank the plethora of things the Mission could choose to do in the sector. Hence, the need for clearly articulated selection/design criteria. The team has adopted this initial set:

Likelihood of achieving demonstrable, material impact within five years. We want performance and we want accountability within the strategy period.

Significance of impact on lives of low income people, particularly women. This is the target population.

Potential for cost-effective replication across India. Our financial, but not our intellectual, resources are limited therefore we want to leverage our contributions.

Strong Indian institutional interest and collaborators. The Indian government, development community, and private sector must be supportive of what we propose.

Strong U.S. institutional interest and collaborators. The U.S. agricultural development community must be supportive of what we propose.

Complementarity with other USAID/India programs. At least initially, the mission does not anticipate a separate Strategic Objective for agricultural activities so leverage within the total USAID program is desirable.

Potential platform for more collaborative/GDA-type mode of operation. This reflects our interest in seeing whether that elements of a new agricultural portfolio can help redefine how USAID operates within the Indian context.

VII. What Could USAID Consider Doing? The Range of Options

In *Creating a Progressive Rural Structure* Arthur Mosher recounted traveling across the Indo-Gangetic Plain with a friend visiting India who asked, “Will this region ever be as productive as Iowa?” Although Mosher had lived and worked in that region for many years, he had not asked himself such a question: “I realized that I had been guilty of a common error. Too frequently we ask ourselves only ‘what should we do next?’ We do not look far enough down the years, visualize what should happen ultimately, then work backward to the present as well as forward from where we are now in developing our plans.”

Our view of the future is an India without hunger in which the agricultural sector, the reinvigorated engine of growth, is science-driven and market-directed to continue the structural transformation of the economy. In order to get to this state, the major challenges are to reform the agricultural marketing system and the technology development system.

The range of potential interventions considered appropriate for USAID support has been drawn from prior understanding, readings, and discussions with interested parties in the U.S. and India. The list is not exhaustive; these are the ones that have attracted the most attention during our all-too-brief review. The range of suggested activities addresses the following topics.

- Policies – focusing on revitalizing food and agricultural policies for improved food security.
- Technologies – focusing on biotechnology, scientific exchanges, and strengthening science capability.
- Production inputs and natural resources concerns – focusing on addressing aspects of water scarcity, such as on-farm water management and irrigation electric power pricing.
- Agribusiness – focusing on market reforms, facilitating agribusiness development, and strengthening information systems.

The team has adopted a descriptive template which was used to elaborate each of the proposed interventions. These are all provided in the Annex. The following brief descriptions are extracted from these fuller elaborations.

Revitalizing Food and Agriculture Policies for Improved Food Security. Agricultural policies that were very appropriate for earlier stages of development in a period of deficits are no longer appropriate today in a period of surpluses. The challenge is to overcome the inertia and to make the reforms in the most constructive manner.

The objectives would be at three levels:

- The first objective would be to raise the quality of discussion and to encourage informed public advocacy to promote needed policy reforms which unleash growth potential in the agricultural sector. It would be measured in terms of number of institutions, policy analysts, and policy-makers involved.
- This collaboration would help re-establish and strengthen the links between USAID/India and Indian agricultural policy-makers and between other dynamic public and private sector policy research specialists and institutions in both countries.
- Positive changes in policies stemming from activity leading to reduced poverty and food insecurity by decreasing consumer prices (through more effective and efficient marketing), better targeting of public distribution, and, ideally, increasing productivity and farm incomes (if the reduced subsidies were for productive investments) would be a very desirable, but added, benefit.

Proposals developed by Indian institutions or jointly by Indian and U.S./international public institutions would be solicited and funded to (1) analyze options for policy reform, (2) review the political economy of adopting the reforms, and (3) carry out workshops and meetings to mobilize public opinion on reforms in the agricultural sector which could lead to an improved policy environment within a three to five year period. Participation of the broader Indian public, with particular emphasis on producers, input suppliers, marketers, and processors, could be organized to help ensure the practicality and potential implementation of desired policies. Some research/analysis would be desirable.

Biotechnology (perhaps re-named “New Sources of Agricultural Growth”). Over the longer term achieving the poverty reduction and food security objectives with presently available technologies alone will be difficult, given the present trends and future challenges facing the rural sector in India. Among the developing countries, India has one of the strongest biotechnology research efforts, backed by world-class scientific capacity and significant government investment. The economic potential of the biotech industry, however, will not be realized without addressing the policy blocks in approval of biotechnology products.

The objective would be to promote a re-vitalized agricultural technology development process in agricultural biotechnology by facilitating a collaborative research relationship between U.S. and Indian agricultural, food and fiber scientists that would benefit the poor by improving their productivity and incomes (developing varieties that are more resistant to abiotic stresses such as drought and flooding and biotic stresses such as pests and diseases) and nutrition. It would be measured in terms of number of institutions and scientists involved. Public or commercial products or services stemming from the research would be desirable and an added benefit.

Areas for consideration and further exploration might include (activity might be staged by):

- Public outreach on biotech – building stakeholders, acceptance, and local demand for biotech.
- Biosafety regulatory policy – strengthening the technical capacity of the regulatory bodies, funding of biosafety research related to risk assessment, policy research to highlight implications of the current environment, and sensitization at the political level.
- Collaborative research and crop technology development -- An umbrella grant program would be instituted which would solicit and fund proposals developed jointly by U.S. and Indian institutions. Targets could include nutritional enhancement, stress tolerance, disease resistance, or focus more on urban and international markets. A range of crops (other than “commercial crops” such as cotton, wheat, rice, maize, and soybeans) might have large potential for collaboration.
- Finally, a collaborative R&D agenda could extend into institutional development issues related to biotech such as technology transfer, public-private sector collaborations, and intellectual property rights management.

Scientific Exchanges. The U.S. and India had a strong program of scientific collaboration, dating back to the late 1950s. More recently exchanges have been essentially suspended. Lacking an alternative source of funding for this purpose, the result has been an in-growing of the Indian agricultural science community, especially in the state agricultural universities.

The objective would be to reinvigorate the collaborative research relationship between U.S. and Indian agricultural, food and fiber scientists, with emphasis on biotechnology but considering other topics, as appropriate. It would be measured in terms of number of institutions and scientists involved. Any commercial products or services stemming from the research would be an added benefit.

An umbrella grant program would be instituted which would solicit and fund research proposals developed jointly by U.S. and Indian scientists and institutions to do adaptive and applied research on products and services which could move to public use within a three to five year period. Categories of topics could be identified by USAID, The World Bank, and the GOI, but might initially focus on biotechnology or, if appropriate, other potential topics of ongoing or contemplated USAID support such as food and agricultural policies, on-farm water management, or agribusiness development (this activity could be an incubator to explore future Mission interests). Primary funding for Indian participants would come, at least initially, from the agricultural research loan from the World Bank. Primary funding for U.S. participants, consisting of travel and lodging/per diem could come from monetization of PL 480 commodities.

State Agricultural University Development. Agricultural science, through the Green Revolution in part led by the newly organized state agricultural universities, unlocked the

formula that transformed the Indian countryside and made tremendous progress in alleviating hunger and poverty. The U.S. and India had a strong program of scientific collaboration, dating back to the late 1950s. That collaboration came to an end some twenty years ago. Lacking this intellectual stimulation and funding for this purpose, the result has been a loss of vigor and an in-growing of the Indian agricultural science community, especially in the state agricultural universities, with a resulting lowering of performance of the Indian agricultural research system.

The objective would be to reinvigorate selected Indian state agricultural universities that had their origins in the 1960s and 70s and benefited from collaboration with U.S. land-grant universities. These universities had, and still have, a major role in developing the technologies that became known as the Green Revolution with immense benefit to alleviating poverty and hunger in India. It would be measured in terms of number of institutions and scientists involved. Any public or commercial products or services stemming from the research would be added benefits.

This activity might proceed in either of two ways:

- USAID could collaborate with the World Bank in designing the follow-on World Bank loan support to Indian state agricultural universities, with the objective of USAID providing a grant technical collaboration component from U.S. land grant universities.
- USAID could design a stand-alone activity to re-activate scientific collaboration and training for selected state agricultural universities.

Either way, research proposals developed jointly by U.S. and Indian scientists and institutions to do adaptive and applied research on products and services for up to three-year periods that could move to public use within a three to five year period could be solicited and funded. If the joint World Bank/USAID route were followed, primary funding for Indian participants, including travel to the U.S., would come, at least initially, from the agricultural research loan from the World Bank and primary funding for U.S. participants, consisting of salaries, travel and lodging/per diem to India, could come from either monetization of PL 480 commodities or, more probably, development assistance funds.

Improved On-Farm Water Management Water will probably be the limiting factor in future agricultural growth. The issues are: inefficient management of water (60 percent of the water lost between distribution headworks and plants in the field); inadequate O&M of facilities; waterlogging and soil salinity; and outdated irrigation and agricultural technologies. In the past, on-farm water management (OFWM) projects funded by USAID and other donors focused on improving distribution channels. Given the new set of issues, fresh programs are now needed shift to more efficient irrigation technologies and water-saving production practices.

The objective will be to establish pilot on-farm water management programs that can be replicated across the country with locale-specific modifications. OFWM has substantial

complimentarity with components of EEE's ongoing Energy Conservation and Commercialization Project. The pilot OFWM could be implemented through these established EEE partners. Success will be gauged by a combination of measures including: the extent of adaptation, associations formed, and measurable water/power saved.

The OFWM techniques identified include.

- New irrigation technologies. The next steps in improving OFWM and reducing irrigation losses are to introduce and analyze distribution systems such as buried pipe, flexible tubing, siphon tubes, and gated pipes. They can be combined with sprinkle, surge, and drip irrigation systems to maximize application efficiencies and minimize distribution losses. Instituting programs that help to shift irrigation from open ditches and flood irrigation to newer distribution and application systems is critical to maintaining the viability of the vast irrigated areas in the region.
- Improved agricultural production technologies Such technologies and production practices include switching to crops that are drought tolerant or require less intensive irrigation, higher-value crops, improved seeds, increased levels/management of inputs, better water control, drip and sprinkler irrigation, watershed management, access to credit, and better marketing systems. Biotechnology could have a potential role here.
- Water management: Establishing suitable government regulations operating in tandem with functional user group associations is seen as necessary for successful sustainable water management. High payoff could result from new legislation that would lead to successful groundwater aquifer management programs and from locally controlled groundwater management districts. Certain areas have begun implementing irrigation management transfer (IMT) programs that transfer responsibility for irrigation O&M to local management organizations, with government only responsible for delivery to the head of the distributary. Providing training for such farmer organizations and other forms of federated WUAs provides another opportunity for USAID assistance.

Irrigation Power Pricing Reforms. Agriculture accounts for 25-30% of electricity use. Electricity – which is controlled at the state level, is sold to agriculture significantly below cost of production. This leads to fiscal short falls for the state electricity boards, resulting in unreliable service. As a result, farmers maximize water pumping during the limited number of hours of power is available, without regard for actual need. The electricity boards are further disadvantaged by the practice of charging a flat rate, thus encouraging large withdrawals at no surcharge. Studies have shown that farmers are willing to pay higher premiums for irrigation electricity on the condition that the supply is reliable. World Bank and other studies have cast doubt on the extent that current electricity subsidies help the poor farmers. Reform in this area is caught in a Catch-22 situation wherein the farmer is willing to pay market prices only if the electricity supply is consistent and reliable, while the utility company can only provide such service if they are paid by the farmers.

The objective is to use U.S. expertise to assist reform-minded states with an enabling environment to implement tariff reforms in the power sector. This would closely tie-in with the objectives of Mission's EEE program's ongoing Energy Conservation and Commercialization Project in Andhra Pradesh. As such, a pilot tariff reform component could be tied into the EEE project and be implemented by the partners of the latter. Alternatively, it could be tied to a irrigation reform project of the World Bank (such as the one in Uttar Pradesh).

The project could include the implementation and analysis of pump metering programs to enable the measuring and valuation of water. Many of the utility companies are already at various stages of this activity. Pilot programs that look at the entire system – from the perspectives of the utility company and the farmer – could be implemented. Central to reform is changing farmer perception that subsidized power for water is an entitlement. Attention has to be placed on building in targeted safety net program that would capture the poor farmers who are unable to pay higher rates of tariffs during the transitional period of the reforms. Also important is cost of surface water as it relates to increasing power tariffs for ground water.

Water Markets; Inter-State Water Rights. Informal water markets - where water is sold by well owners to neighbors - is widespread and highly localized. Historically, they have enabled poor farmers to obtain water and helps the well-off farmers with the cost of maintaining a well. Higher demand (rural & urban) and inefficient use is increasingly placing pressure on limited water supplies. Mistrust and competition between states neighboring shared waterways leads to conflict and sub-optimal use of this precious resource. A regulatory framework that lays the groundwork for negotiation and cooperation between these states would lead to valuing the water and sharing of water in a manner that captures its economic costs and leads to mutually beneficial gains. Once water is valued as a commodity, it will promote efficient use through: optimal cropping patterns, reductions in run-offs etc.

The objective will be to establish formal water markets in select areas where clear problems exist, and where demand for workable solutions has been expressed by the local authorities and stakeholders. For inter-state water rights, the objective is to lay the regulatory groundwork for negotiations and cooperation in this sensitive area. At the local level, success will be determined by number of communities/municipalities that enact a regulatory framework for such markets to effectively function. At the state level, it will be measured by the initiatives made toward inter-state cooperation. The establishment of such a regulatory framework will also pave the way for other reform activities. Relevant Indian officials would establish the regulatory framework and facilitate negotiations and implementation shared water resources between neighboring states.

USAID could fund a combination of short and long-term U.S. advisors to work on a pilot project in a select area where two or more states have conflict over common waterways. The location of the pilot would ensure that the states involved are reform minded with a

perceived demand for such arrangements. Other donor activity in this area will also be considered so as to avoid duplication, and looking to build complementarily. In conjunction or separately, a pilot projects would be conducted to demonstrate workable water markets at the local level, with design emphasis placed on replicability. Activities in the area of water markets and inter-state water rights would compliment the many programs of the World Bank, and other donors involved with irrigation and water management. The possibility also exists for building this under EEE's programs.

Agricultural Market Reform. Current tax structures and regulatory procedures, e.g. licensing, on agri-business enterprises are viewed by the private sector as overly burdensome and restrictive. This results in under-investment in the agri-business sector, reduced demand for agricultural products and lower prices to farmers, the majority of whom are smallholders. Policy analysis is needed to identify and propose reforms conducive to agri-business formation, investment and market efficiency.

The objective is to reduce disincentives to the entry or expansion of agri-business enterprises and reduce transaction costs in agricultural markets. Achievement of these objectives would be measured by the number of new entrants in the agribusiness sector, increased efficiency in agricultural markets, greater demand for agricultural produce at the farm level and higher farm gate prices.

Contracts would be awarded to Indian private sector institutions who would analyze and recommend changes to incentive structures, legal and regulatory frameworks.

Horticultural Markets Development. India is the world's second largest producer of fruit and vegetables, yet only an estimated 2% of this produce is processed in any way prior to marketing. The bulk of this produce is grown on smallholder plots. Marketing entails complex networks of middlemen, often with as many as seven levels of handling before reaching the consumer. Delivery to market is generally in bulk shipment by road resulting in up to 30% wastage. Rapid urbanization in the country is expected to increase demand for these commodities, thereby adding to their value.

Processing allows individuals to take advantage of higher prices in distant markets. It also stabilizes markets by reducing wide price swings associated with gluts and deficits in local markets. And because processing typically demands more raw product, local production is stimulated, thereby increasing household income and employment opportunities. Poor quality and non-standardized produce, however, restrict mechanized processing and result in inferior final products. Interviews with private entrepreneurs suggest that they have neither the technical know-how nor the resources to work with individual farmers to acquire the quality raw product needed as the basis for a processing industry. USAID/India's Agricultural Commercialization Enterprise (ACE) project was highly successful in removing financial bottlenecks impeding agri-business but it did not perform as well in furnishing the technical assistance required by the sector (RAI, 1995).

The objectives of this activity would be two-fold: to improve the quality of produce at all levels of the marketing system, and, to increase the percentage of India's fruit and

vegetables that is processed. Success of the activity would be measured by reduced losses on-farm and in transit, improvements in produce quality and uniformity, greater farmer recognition of produce standards, and increased processing of horticultural produce.

These objectives would be met by a multi-functional agri-business facility working in selected states to build capacity within and linkages between horticultural producers, processors and markets. Technical assistance would be provided for market studies and marketing, product development, processing and storage, institutionalization of grades and standards, development of business or financial plans, and assistance in obtaining loans through commercial lenders.

Contracts will be awarded to qualified Indian or multi-national firms to manage the technical assistance activities in selected states. Non-Indian recipients will be expected to partner with national organizations or institutions.

Support for Rural Information Communication Technology. The information communication technology (ICT) revolution is already underway in India, and will invariably reach the rural sector with or without USAID assistance. The Indian government, private sector and NGOs are already operating various models/pilots in rural areas. The value USAID is able to add is its help in hastening the process through an infusion of funds and cutting-edge technology, providing content and direction that specifically addresses the rural poor, and providing coverage to areas that may be overlooked.

The U.S. is the world leader in ICT and as such is well suited to lend assistance in this area. Already many collaborative ICT type initiatives between U.S. based interests and their Indian counterparts exist/are being planned. By investing, USAID can ensure that its core objectives (including agricultural development) are promoted through ICT – a medium which has the potential to reach a wide spectrum of clientele and beneficiaries. Under the EG program a number of ICT initiatives encompassing policy regulation, workshops, and telecenters have been proposed. The ICT activities specific to agriculture would fit-in perfectly with EG program – especially the work on telecenters.

ICT encompasses speed, quality and precision. In the provision of services to the agricultural sector, it had the advantage of: providing the information using the latest technology that can be updated immediately, having operating costs that are lower than human resources, potential for translating message in many languages, be interactive providing feedback, and use of multimedia and virtual reality programs that is capable captivating an audience for message dissemination. A clearly lacking service in India is the accessibility to market analysis that forecasts agricultural conditions -- taking into account weather, prices, demand & supply, global conditions, WTO regulations, phytosanitation, and a host of other factors that help farmers plan. This initiative would help establish such capacity for dissemination through ICT. The USDA is also a potential partner in this component of the program.

The agriculture ICT program would link the farmer, research, marketing, and extension (government and private) to each other into local, national and global networks. It would include market information, production planning, on-farm and post-harvest management and value addition, e-contracting, market intelligence and analysis. Clients would include small-scale subsistence farmers as well as larger commercial farmers eyeing larger markets. It would focus on providing connectivity (deployment of technologies to enable rural families to gain access to the internet at a reasonable bandwidth), and content (the substance of the message and its relevance to farming families). This program would introduce new and innovative ICT applications in pilot projects that can then be picked up by the GOI for wider dissemination. Potential Indian partners include: The National Institute of Agricultural Extension Management (MANAGE), ICRISAT, NGOs such as the M.S. Swaminathan Foundation, and others identified under the EG group's ICT program.

VII. Ranking the Options

Richard Bradfield, the noted agronomist, was remembered for saying: "There are many interesting problems. Some of them are important." We hope to focus on the important.

In addition to the descriptions in the Annexes, the team developed analytical matrices for use in determining how responsive each proposed intervention was to the Mission's selection/design criteria (described in Section VI) and in ranking the proposed interventions. These completed analytical matrices prepared for each intervention are also provided in the Annex. They generated the following scores representing the total points awarded to each intervention out of a possible total of 120.²

Food and Agriculture Policies	105 points
Biotechnology	98 points
Scientific Exchanges	73 points
State Agricultural University Development	69 points
Improved On-Farm Water Management	86 points
Irrigation Power Pricing Reforms	80 points
Water Markets; Inter-State Water Rights	57 points
Agricultural Market Reform	81 points

² See the attached table. These rankings should be reviewed with some caution. They are subjective and should be considered within a range of accuracy. The team has just not had enough time to do detailed reviews of all topics. The timeliness of issues, the \$2 million funding constraint, and the 5-year time-period for demonstrable results factor very heavily in the rankings. The respective justifications in the annexes are more informative.

Horticultural Markets and Enterprise Development 79 points

Support for Rural Access to Information
Communication Technology 88 points

Food and Agricultural Policies ranks very high on almost all of the selection/design criteria for ranking USAID intervention. If the reforms could come about in the right way they could have significant positive benefit for the poor. The GOI recognizes that it has a problem. The activity could have strong support from both Indian and U.S. constituencies, and there are identifiable partners. However, it has to be acknowledged that this is a high-risk, high payoff option. The likelihood of achieving demonstrable, material impact within five years is problematic – but if achieved, the benefits would be immense.

Biotechnology also ranks very high on almost all of the selection/design criteria. It could have significant positive benefit for the poor, it could have strong support from both Indian and U.S. constituencies, and there are identifiable partners. This activity is uniquely timely – the future is now for this option. However, it has to be acknowledged that this is a potentially controversial area. It also has to be recognized that because of European public opinion, we are the source of support if it is to be done; this is definitely our competitive advantage.

Scientific Exchanges ranks high on several selection/design criteria but falls a bit on likelihood of achieving demonstrable, material impact within five years (the payoff would be longer-term), significance of impact on lives of low-income people, particularly women (especially in the near-term), and potential for cost-effective replication across India (this just isn't the purpose of this option). On the other hand it would have extremely high U.S. interest and collaborators.

State Agricultural Universities might logically follow and build on the Scientific Exchanges. Strong Indian and U.S. historical ties and the need to re-invigorate the Indian agricultural research system are important factors to consider. However, it is not likely to have much demonstrable impact within the next five-year period.

Improved On-Farm Water Management is a promising candidate that is particularly attractive because it addresses an important problem and because of its close relationship to planned and ongoing activities in the Environment, Energy, and Enterprise Office.

Irrigation Power Pricing Reforms also has a close relationship to planned and ongoing activities in the Environment, Energy, and Enterprise Office. Progress in this area, if politically feasible (which is probably the biggest obstacle) could go a long way to reducing government subsidies, restoring financial health to the State Electricity Boards, and perhaps even to privatization of electricity distribution.

Water Markets and Inter-State Water Rights is arguably a high-risk, high-payoff activity but perhaps an activity whose time has yet to come. Still, investigations in this area could be profitable.

Agricultural Market Reform responds to priority concerns facing agribusiness. This activity might be staged as a transition to the proposed Horticultural Markets and Enterprise Development activity.

Horticultural Markets and Enterprise Development builds on previous USAID activities, benefiting from an improved market environment and lessons learned.

Support for Rural Access to Information Communication Technology, scores high on several categories, is cutting-edge, and has a close relationship to planned and ongoing activities in the Program Development and Economic Growth Office.

IX. So, How Does USAID/India Best Re-enter the Agricultural Sector?

Probably more than a lack of financial resources, our need to develop a clear understanding of agriculture's role in India's broader economic development and structural transformation will constrain our re-engagement over the short term. Accepting this conclusion lends weight to the proposition that the Mission should start small, probably by bridging into agriculture from an activity or two in its current portfolio. Then, at a speed commensurate with the growth of its internal capabilities, over the next 24 to 36 months it may add a new stand-alone activity. We have separated the potential activities into two tiers.

First-Tier

If USAID wants to get the most potential impact from the least money and wants to get started promptly, it might focus initially on supporting **Food and Agricultural Policy** changes. This is a high-return, but also high-risk venture. It would have the huge advantage of complementing PL 480 Title II activities by facilitating the reemergence of a private marketing system and, better targeting of subsidized programs. Both would benefit producers and consumers. Such an investment could be considered as the first step of an eventual exit strategy.

Close behind might be support for **Biotechnology**, arguably politically sensitive but very important for infusing improved technologies to fuel increased agricultural productivity and improved nutrition. There is little competition from other donors.

This package – food and agricultural policies (\$750,000 to \$1,000,000) and biotechnology (\$500,000 to \$750,000)– could fit easily within the initial \$2 million guidance.

Second -Tier

Support for mutually beneficial **Scientific Exchanges** (with or without PL 480 funding support) could be activated fairly easily. We project that this activity could be funded at approximately (\$500,000)³ It would have the advantage of leveraging World Bank funding. And it would be even more attractive if monetized PL 480 funding could be obtained. The support for scientific exchanges might be a bridge to broaden support for the state agricultural universities, which would take a bit longer to design and activate.

Policy support for facilitating **Agricultural Market Reform** would not be big-ticket and also could be designed rather promptly. India agribusiness has identified this area as a high priority.

Improved On-farm Water Management would be a bigger investment. It would also have a longer design period. It and **Irrigation Power Pricing Reforms** are closely related to and could benefit from close collaboration with programs of and perhaps supervision from the Mission's Environment, Energy, and Enterprise Office.

Support for Rural Access to Information Communication Technology is closely related to and could benefit from close collaboration with programs of and perhaps supervision from the Program Development and Economic Growth Office. The value USAID could add is to help in hastening the process through an infusion of funds and cutting-edge technology, providing content and direction that specifically addresses the rural poor, and providing coverage to areas that may be overlooked.

State Agricultural Universities and **Horticultural Markets Development** are both larger ticket activities and might require extensive design time.

Water Markets; Inter-State Water Rights is a high risk/high return venture.

We believe it is quite feasible to move thinking along considerably – to test potential and add details – of several of these proposed activities, particularly Food and Agriculture Policies and Biotechnology, even before the Mission strategy is submitted for AID/W review. Certainly it is feasible (of course, assuming GOI concurrence) to have the first-tier projects ready to go by the start of the next fiscal year.

We don't have an answer to the USAID/Delhi staffing dilemma. It would be a huge advantage to have staff in Delhi with agricultural expertise and responsibility. We would, of course, recommend this.

In the transition, AID/W might be able to assist using e-mail and, if necessary, TDY visits.

³ Fifty U.S. scientists per year could be budgeted at @\$3,000 for airfare, @\$4,500 for lodging and per diem (\$150/day for 30 days each), plus another \$125,000 for administration, incidentals, etc.

X. Proposed Results Frameworks for the Best Bets

Development Hypotheses

1. Food insecurity in India is attributable to inappropriate government policies restricting food stock movement and interventions that distort food prices.
2. Productivity increases derived from the Green Revolution's crop technologies have reached their maximum limits.
3. Low agricultural yields per hectare are a function of inefficient input use, foremost water and energy.
4. Over regulation is a disincentive to private investment in Indian agriculture and agribusiness.
5. Inadequate market development (information, infrastructure) is resulting in lost income to farmers.

Strategic Objective

To increase economic growth through agriculture with focus on reducing poverty and food insecurity among India's poor

Alternative SO(a): To reduce poverty and food insecurity among India's poor through sustained agricultural productivity (greater efficiency, resource mobilization and re-allocation)

Alternative SO(b): To increase the poor's access to food through increased agricultural productivity and economic growth

Alternative SO(c): To reduce poverty and food insecurity among India's poor through agriculture-based economic growth

Intermediate Results

IR 1.0 Revitalization of national grain procurement and distribution policy

Indicator 1.1 Increased agricultural policy dialogue (including grains) between USAID/India, GOI and USG

- Indicator 1.2 GOI food distribution programs reviewed
- Indicator 1.3 GOI food distribution programs reformulated
- Indicator 1.4 Reduced aggregate surplus stocks of wheat and rice
- Indicator 1.5 Increased inter-state movement of wheat and rice
- Indicator 1.6 Reduction in public grain storage losses
- Indicator 1.7 Indian food grain minimum support prices reflecting world market trends

Activity 1.1.1 USAID/Ford Foundation-funded IFPRI analyses of GOI grain procurement and distribution policy

Activity 1.1.2 Supplemental analyses by leading Indian national policy research institutions on current GOI grain procurement and distribution, including improved targeting of GOI food aid programs

Economic Growth Linkages IR 1.0

- Government savings on grain purchase, transport and storage available for other economic growth expenditures (estimate of post-harvest grain losses?)
- Lower grain prices result in growth in real income for consumers
- Lower grain prices stimulate agricultural diversification to higher value crops
- Increased grain sales invigorates tertiary sectors, e.g. transportation

Assumptions crucial for success IR 1.0

- Policy recommendations prove acceptable to GOI and state governments
- Political will exists to change grain procurement and distribution policies
- Consumer demand for food grains sufficient to draw down stocks in spite of new production
- Private sector marketeers re-enter the food grain trade
- Farmers diversify into higher value crops

Exogenous risks leading to failure of IR 1.0

- Macro-economic events reduce consumer demand for grain
- Instability in food grain prices
- Delays in implementation of USAID/India-funded policy analyses lead to recommendations that are no longer relevant

Synergies between IR's

- Lower grain prices will increase food availability among the poor, promoting increased consumption, nutrition and health
- Lower grain prices will increase real income, thereby allowing expenditure on a wider range of foods, thus promoting better nutrition
- By increasing food consumption and caloric intake, one constrain on labor productivity is removed
- Removing price distortions in grain markets is expected to result in greater overall market efficiency and farm/crop productivity, thereby supporting economic growth

- Greater market efficiency and farm productivity will contribute to improved water and energy management

IR 2.0 Sustained crop productivity

Indicator 2.1 Constant or increasing yields per hectare for constant or decreasing levels of inputs over time (MT/ha./quantities of inputs)

Activity 2.1.1 Technical assistance on use of biotechnology in agricultural research

Activity 2.1.2 Public outreach campaigns on biotechnology in agriculture

Activity 2.1.3 Scientific exchanges between India and the U.S.

Activity 2.1.4 Development of state agricultural universities

Activity 2.1.5 Improved on-farm water and energy management

Activity 2.1.6 Irrigation power pricing reform

Activity 2.1.7 Increase coverage of formal water markets in rural areas

Activity 2.1.8 Rationalization of inter-state water rights

Economic Growth Linkages IR 2.0

- Increased crop productivity implies lower costs per unit output, resulting in greater returns (income) to producers
- Increased farm incomes lead to greater demand for locally produced goods and services
- Increased productivity implies greater output per unit land, increasing overall output, household food availability and surplus production for marketing
- Increased productivity sustains low food prices, critical for urban wage earners
- Increased crop productivity will free up resources (energy, water, labor) for other economic activities
- Increased crop productivity will allow the agricultural sector to diversify crop production

Assumptions crucial for success IR 2.0

- Public views on use of biotechnology in agriculture are supportive
- GOI policy on use of biotechnology in agriculture is supportive
- State research on crop productivity is adequately funded and focused appropriately
- State research on crop productivity is appropriately targeted
- New technologies are commercially viable
- New technologies can be widely disseminated to farmers
- New technologies are consistent with farmers' available resources (water, land, finance)

Exogenous risks leading to failure of IR 2.0

- Scientific evidence of biotechnology hazards curbs research
- Biotechnology becomes politically untenable in India

- Intellectual property rights thwart progress in development and use of specific biotechnologies

Synergies between IR's

- Increased food availability and income from crop sales will enhance household food security, nutrition and health

IR 3.0 Increased value-added in agricultural sector

Indicator 3.1 Increased numbers of agricultural processing firms

Indicator 3.2 Expanded output of existing agricultural processing enterprises

Indicator 3.3 Increased numbers of employed by non-farm rural sector (agro-processing industries)

Indicator 3.4 Increased demand for agricultural produce as inputs as measured in tons or rupees purchased by processing industries

Activity 3.1.1 Policy analysis to reduce regulatory disincentives to agri-business investment

Activity 3.1.2 Organizing horticultural marketing systems to add value to horticultural produce

Economic Growth Linkages IR 3.0

- New agriculture-based industries will directly generate employment and income opportunities
- Increased demand by processors for inputs will result in higher prices for produce grown by smallholder farmers
- Increased farm production will increase demand for farm labor, thereby raising wages of farm workers, many of whom are among the landless poor
- Industrial start-ups will stimulate tertiary industries, e.g. machinery, packaging, transportation, etc.

Assumptions crucial for success IR 3.0

- Policy reforms create sufficiently conducive business environment for investment
- Agri-business entrepreneurs respond to new market incentives and establish required marketing infrastructure
- Marketing reforms are put in place to reduce transaction costs
- Farmers will be able to meet quality and quantity demands of processors
- Domestic market for processed foods is sufficiently deep to support new industry
- There is a sufficiently deep export market for Indian processed agricultural products

Exogenous risks leading to failure of IR 3.0

- State-induced market distortions bias against horticultural production

- Processing industry fails to accurately gauge public tastes and preferences leading to market collapse
- Costs (and prices) of processed products exceed those consumers can or are willing to pay

Synergies between IR's

- Many agro-processing industries would be best situated in rural areas where economic growth (employment and income) is needed, slowing rural-urban migration
- Increased income will permit increased food consumption thereby improving nutrition and health

ANNEX 1

Descriptive and Analytical Templates

Descriptive Template #1

- Problem Area:** Food and Agriculture Policies
- Proposed Intervention:** Supporting analysis and public awareness to encourage policy reforms in the food and agricultural sectors.
- Five-Year Objective:** The objectives would be at three levels:
- The first objective would to raise the quality of discussion and to encourage public opinion to promote needed policy reforms to unleash growth potential in the agricultural sector. It would be measured in terms of number of institutions, policy analysts, and policy-makers involved.
 - This collaboration would help re-establish and strengthen the links between USAID/Delhi and Indian agricultural policy-makers and between other dynamic public and private sector policy research specialists and institutions in both countries that have eroded with the withdrawal of USAID support to the agricultural sector over the past few years, that is, USAID would get a seat at the policy table.
 - Positive changes in policies stemming from the activity leading to reduced poverty and food insecurity by decreasing consumer prices (through more effective and efficient marketing), better targeting of public distribution, and, ideally, increased productivity and farm incomes (if the reduced subsidies were used from productive investments) would be a very desirable, but added, benefit.
- Rationale:** Two major problems seem to overlay Indian agricultural policy:
- Procurement prices for wheat and rice are set above market levels, The Food Corporation of India (FCI) is sitting on a buffer wheat and rice stock of 60 (going on to 80) million tons, and targeting of the public distribution system (PDS) is weak (especially not reaching the large number of the rural poor). The 60 million buffer stock level is twice as much as the storage capacity available with the procurement agencies of the government. This stock is about 150% more than the norms for buffer stocking for food security and what is required to feed the public

distribution system. Simultaneously, however, there are 250 to 300 million people who remain undernourished and live below the 'poverty line'. Food waste in public storage is high. The private market -- which is an alternative method of rewarding production and aiding poor consumers -- is being pre-empted from participation in a major share of the food grains market. Individual states have their own respective internal marketing and distribution problems that compound the inefficiencies.

- Subsidies for food and fertilizer (both Centrally funded) and for electricity and water (state funded) comprise fully half of the annual public investment in agriculture.
 - The case could be made that the amount of money used for subsidies could be more productively spent for other purposes – research, rural infrastructure, etc.
 - The case also could be made that the potential positive welfare value of the subsidies is more than offset by the ineffective state of output marketing and pricing -- what farmers get in subsidies is offset by marketing problems – a 'wash' with devastating economic implications due to gross inefficiencies in allocations of resources.

This situation speaks volumes about the glaring contradictions in policies on the food front and the objectives of poverty alleviation and food security. The reasons for these problems are twofold:

- These policies that were very appropriate for earlier stages of development in a period of deficits are no longer appropriate today in a period of surpluses. The policy process has not fully recognized that times have changed and, correspondingly, policies must change.
- The political process for agricultural policies – particularly for establishing the minimum support price (MSP) -- is dominated by four states with surpluses – Punjab, Haryana, western Uttar Pradesh, and Andhra Pradesh – which account for 95 percent of wheat and rice procured. These states also happen to be key components of the current fragile coalition in political power. The various states are saddled with high and rising costs for electricity and water irrigation subsidies,

the former being a major contributing factor to the weak financial status of the state electricity boards.

The policy environment for Indian agriculture is a mess that is – as expenditures for subsidies mount and economic growth is sacrificed as the private market is being circumvented with resulting slowing or reversal in combating poverty and food insecurity – rapidly nearing the breaking point. The challenge is to hasten reform and help steer it in the most positive direction to address poverty and food insecurity.

Description:

We propose to work, at least initially, on the first of the two major policy problems, that is, reform of the agricultural marketing system, including government procurement and public distribution. Problems exist at both the central and state levels of policy-making. There is widespread recognition – both within the government, among policy analysts, and by the general public -- that there is a major problem – hinging on the high procurement prices and the problems in public distribution -- and that there are known solutions. The policy challenge is not what to do but how to do it. The ‘what to do’ to ensure that food markets, particularly grain markets, work for the poor is documented in several excellent recent reports:⁴ The challenge is to find a way to implement the known solutions, addressing both the central and the state levels of policy-making.

1. Establish minimum support prices (MSP) to cover risk but not necessarily full production costs – for major commodities only – at or below market prices.
2. Decrease subsidy and improve targeting of public food distribution, for example, (a) improving the quality and coverage of the Integrated Child Development Services Scheme (ICDS), (b) improving access of poor households through self-targeting food for work, cash for work, and (c) improving targeting and delivery of the PDS such as moving forward in implementing the Targeted Public Distribution System (TPDS) by testing

⁴ Ashok Gulati, “Reforms and Policies for Agriculture,” in volume in honor of Manmohan Singh, chapter 4, pp. 139-163; Kirit S. Parikh, “Food Security: Individual and National,” in volume in honor of Manmohan Singh, chapter 11, pp. 253-279; *India Foodgrain Marketing Policies: Reforming to Meet Food Security Needs*, in two volumes, Rural Development Sector Unit, South Asia Region, The World Bank, August 17, 1999; *Economic Reforms A Medium Term Perspective*, Recommendations of Prime Minister’s Economic Advisory Council, February 2001; *Report of Expert Committee on Strengthening and Developing of Agricultural Marketing*, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, June 2001.

alternative schemes such as food coupons/vouchers and scaling up successful experiences, and improving targeting of below poverty line (BPL) households through community participation.⁵

3. Gradually sell down or distribute the government food grain stocks and reform (dismantle and/or reconfigure) the FCI to intervene in the market only on the basis of clear and transparent “price band rules” that set the upper and lower price limits that allow adequate marketing margins for the private sector to operate.
4. As/after actions 1, 2, and 3 (above) are achieved, implement recommendations of the various expert studies to strengthen private sector marketing, including:
 - a. Strengthening the market information system.
 - b. Improving the process of establishing grades and standards.
 - c. Studying potential for extending forward and futures markets to the agricultural sector.

These actions would be basic steps toward the goal of providing the environment to raise incomes in rural areas and to foster more investment opportunities to facilitate viable diversification.

Proposals developed by Indian institutions or jointly by Indian and U.S./public international institutions would be solicited and funded to: (1) analyze options for policy reforms; (2) review the political economy of adopting the reforms, and (3) carry out workshops and meetings to mobilize public opinion on reforms in the agricultural sector which could lead to an improved policy environment within a three to five year period. Participation of the broader Indian public, with particular emphasis on producers, input suppliers, marketers, and processors, could be organized to help ensure the practicality and potential implementation of desired policies.

Some research/analysis would be desirable, including studies on:

1. Costs and benefits of the various options.
2. Incentives, including implications thereof, to influence key states to reduce pressures on high MSP.
3. Better understanding of options for risk management, including forward trading and futures contracts.

⁵ See “Sector Profile – Food Security in India” by Ashi Kohli Kathuria for more details.

4. Options to improve targeting of public distribution.

Potential U.S. Partner(s): U.S. policy analysts working in public (e.g., USDA) and private (U.S. universities and policy analysis organizations) agriculture and food/fiber policy research institutions and selected public international institutions such as IFPRI. The India mission might either directly access these individuals and institutions or access them through the G/EGAD-managed Agricultural Policy Development (APD) Project.

Potential Indian Partner(s): Indian scientists working in public and private agricultural and food/fiber policy research institutions as well as the India resident office of the World Bank. It is assumed that the sponsoring GOI office would be some combinations of the Ministry of Agriculture (which handles marketing) and the Ministry of Food (which handles public procurement and distribution).

A start has been made with the Ford Foundation/USAID grant to the International Food Policy Research Institute (IFPRI) to carry out the study on “Revitalizing Policies for Food Security and Poverty Alleviation in South Asia,” due to begin about December 2001. This activity, embracing the South Asian region but focusing on India, has three basic objectives: (1) create synergy among policy makers in South Asia to take more rationale and effective decisions pertaining to issues of high importance, such as food security and poverty alleviation; (2) conduct quality research on applied policy issues in collaboration with local institutions and researchers; and (3) build capacity of local institutions to carry out analytical studies even after the termination of the project.

At least four categories of Indian individuals and institutions should be involved:

1. Analysis of public procurement options and related marketing reforms: Policy analysts working at IFPRI and major Indian policy institutions such as the Centre for Economic and Social Change in Hyderabad (CESS/Hyderabad) and the Indira Gandhi Institute of Development Research (IGIDR) in Mumbai and perhaps some of the Agro-Economic Research Centers supported by the Ministry of Agriculture such as the Indian Institute of Management (IIM) at Ahmedabad or

the Institute of Economic Growth (IEG) at Delhi University.

2. Analysis of public distribution options (improving the PDS, targeting): This might involve the same group as in #1, a different group (for example, adding Mahdura Swaminathan at the Indian Statistical Institute (ISI) at Kolcota, or a combination.
3. Political economy: Researchers at IFPRI, CESS/Hyderabad, IGIDR, and other Indian policy analysts working in national and state policy institutions in key states that either are more progressive and therefore likely to lead by example or that pose challenges that must be met if reforms are to take place (particularly Punjab, Haryana, western Uttar Pradesh, and Andhra Pradesh).
4. Public awareness: Institutions that might play key roles in mobilizing constructive public awareness such as the Federation of Indian Chambers of Commerce and Industry (FICCI).

If additional funding were available, we would recommend analysis of the second major problem:

1. Analysis of options (investments in research, roads, communications) for funding now used for subsidies for electricity, water, and maybe fertilizer (centrally funded but justified with state support).
2. Political economy: Analysis of tradeoffs between subsidies and increased productivity and decreased food prices in key states.

Design Issues:

Who would organize and administer the program?

How could policy implementation be best stressed?

Analytical Template #1**Problem Area:** Food and Agricultural Policies**Proposed Intervention:** Supporting analysis and public awareness to encourage policy reforms in the food and agricultural sectors**Total Score:** 105 points**Likelihood of Achieving Demonstrable, Material Impact Within Five Years (15 points out of 20)**

The prospects for raising the quality of public discussion and for re-establishing and strengthening links between USAID/Delhi and Indian policy-makers are high. The problem is so central to future higher economic growth and to poverty alleviation and food security that the policy-makers and public are hungry for good ideas. The prospects for actually making major changes in Indian agricultural policies during the project period could be characterized as high risk/high payoff. However, again, the problem is so central to future higher economic growth and to poverty alleviation and food security that “it is better to have loved and lost, than never to have loved at all.”

Significance of Impact on Lives of Low Income People, Particularly Women (15 points out of 20)

Large numbers of low-income people would be direct recipients of the benefits of policy changes through higher farm incomes, hopefully lower food prices, and more targeted public distribution of public food grains.

Potential for Cost-Effective Replication Across India (15 points out of 20)

Again, we have to note that this is a high risk/high payoff venture. Ideally the Central government will take the lead and states will emulate successes in other states. And ideally the political system will recognize the high costs of the current policies and find ways to compensate the special interests that are interfering with positive change.

Strong Indian Institutional Interest and Collaborators (20 points out of 20)

The GOI clearly recognizes that it has a major problem and is seeking viable solutions. Discussions in India indicate that many analysts in national research centers and state agricultural universities would be interested in participating. However, special attention would be needed to ensure the notion of practical change is understood and factored into proposals and research protocols. Private sector Indian researchers are interested, but few. The other donors, particularly the World Bank, would be very interested in collaborating.

Strong U.S. Institutional Interest and Collaborators (20 points out of 20)

There is strong interest among the public and private sector research community. Certain individuals such as Peter Timmer (to become Chief Economist at USAID), John Mellor, and staff at IFPRI (Ashok Gulati, Peter Hazell) have indicated interest in participating.

Complementarity with Other USAID/India Programs (10 points out of 10)

This problem is so central to development success that the actions proposed would significantly complement all USAID/India investments in population/health, environment, democracy and government, and food aid.

Potential Platform for More Collaborative/GDA-Type Mode of Operation (10 points out of 10)

The World Bank has complementary actions already underway. The previously mentioned IFPRI grant is over-half funded by the Ford Foundation.

Descriptive Template #2

Problem Area:	Technology
Proposed Intervention:	Biotechnology
Five-Year Objective:	The objective would be to promote a re-vitalized agricultural technology development process in agricultural biotechnology by facilitating a collaborative research relationship between U.S. and Indian agricultural, food and fiber scientists that would benefit the poor by improving their productivity and incomes (developing varieties that are more resistant to abiotic stresses such as drought or flooding and biotic stresses such as pests and diseases) and nutrition. It would be measured in terms of number of institutions and scientists involved. Public or commercial products or services stemming from the research would be desirable and an added benefit.
Rationale:	<p>Yields are bumping up against biological limits in more favorable areas and pests, diseases, and stress limit actual yields in these areas and particularly in less favorable areas. Nutritional content of much of the diet is deficient. Given the present trends and future challenges facing the rural sector in India, achieving the poverty reduction and food security objectives with presently available technologies alone will be difficult.</p> <p>Among the developing countries, India has one of the strongest biotechnology research efforts, backed by world-class scientific capacity and significant government investment. In February 2001, India announced a biotech R&D budget increase of almost \$40 million for public research, above the \$500 million already spent in the last ten years, along with significant tax exemptions for biotechnology industries. These investments are indicative of the economic growth potential seen in biotechnology, viewed by the GOI as having similar potential to that demonstrated by the IT industry.</p> <p>The economic potential of the biotech industry, however, will not be realized without addressing the policy blocks in approval of biotechnology products.⁶ For example, this</p>

⁶ In a landmark decision on October 18, 2001, the Union environmental ministry's Genetic Engineering Approval Committee (GEAC) has ordered destruction of genetically modified cotton grown illegally over hundreds of hectares in Gujarat. In a later report it was speculated that Navbharat Seeds, the Ahmedabad-

summer, India's Genetic engineering Approval Committee (GEAC) declined approval of Monsanto's insect-resistant genetically engineered cotton for commercial production, instead call for more regulatory research and testing. India has no biotech-derived crops under commercial-scale production; Bt cotton was the furthest along in approval to date. This incoherence in the Indian biotechnology regulatory system is recognized by the government at high levels and thus indicates a potential entry point for USAID assistance. In June of this year, Prime Minister Vajpayee commissioned the All-India Biotechnology association to analyze why biotech industry growth has been poor despite large government investments in research. The report, which involved international consultations, points to the conflict of interest, red tape and lack of transparency in the "draconian" biotechnology regulatory system.

Both India and biotechnology are leading U.S. foreign policy interests. As one of the largest developing countries, India is a significant market for U.S. seed companies and is a key target for addressing global food security and nutrition such as meeting the World Food Summit goals. India's acceptance of biotechnology would provide an important signal in the ongoing debate over biotechnology, a signal that could help U.S. agricultural trade interests. In addition, as a major recipient of U.S. food aid, there have been at least two episodes where U.S. food aid has been stalled in India related to questions surrounding biotechnology. Finally, from a development perspective, the outstanding technical capacity of India in biotech makes it one of the best-poised countries to realize the potential benefits of biotechnology. Interest in biotechnology is also increasing in USAID, with Congress have first placed a \$30 million directive in FY 2001 legislation. A growing domestic constituency led by producer groups is looking to USAID to demonstrate the relevance of biotechnology to problems of poverty, hunger, and malnutrition in the developing world.

Two R&D initiatives begun last year by G/EGAD and G/PHN using CSD funds that are particularly noteworthy for India are "Golden Rice" and high-carotenoid mustard oil. The second is particularly focused on India, involving

based company which sold the Bt cotton seeds to farmers in Gujarat may have to pay over a \$1 million as compensation as well as destroy its seed production of this pirated variety. The guiding principle was that compensation for the unauthorized variety would be borne by the "polluter" as per environmental law.

its Agricultural for Biotechnology for Sustainable Productivity project, the Tata Energy Research Institute (TERI), and Monsanto, to develop high-carotenoid mustard. Using donated proprietary technology (a high carotene transgenic), the partners are developing varieties of mustard that will provide three times more beta-carotene than unrefined (red) palm oil. These varieties would have excellent application in alleviating Vitamin A deficiency in India. The vitamin-rich oil could be used directly or as a fortificant in a variety of food preparations, and constitutes a low-cost and sustainable source of safe Vitamin A in the diets of the poor.

A potential collaborative effort using purely public sector institutions is in the development of transgenic papaya resistance to the viral disease, ringspot, which causes major losses in India. Transgenic papaya is now widely grown in Hawaii and is credited with saving that state's industry. Some initial communication with Cornell University researchers (who proposed the effort) has been underway in the context of USAID's new \$30 million plant biotechnology directive first appearing in the FY 01 legislation.

Collaboration in biotech could be considered from four inter-related perspectives:

- Poverty alleviation and food security -- particularly through improving productivity of staple crops through traits such as pest-disease-weed resistance and drought or salt tolerance and improving nutritional quality of foods, for example development of beta-carotene enhanced mustard oil.
- Environmental quality of agriculture -- particularly countering environmental erosion associated with the intensive agricultural practices in some parts of India, e.g., salinization of soils and heavy pesticide and fertilizer use. The use of genetically-engineered disease-resistant crops can help reduce use of harmful pesticides as demonstrated with the adoption of Bt cotton by China, South Africa, and the U.S. Further development of the national biosafety regulatory system can also be framed in the context of environmental sustainability of biotech.
- Institutional development -- particularly in the context of USAID's earlier experience in establishing the

strong agricultural research system, as modeled after the federal/U.S. land grant university approach. Bringing the Indian agricultural research establishment into the next generation – emphasizing things like biotech, private sector collaboration and technology transfer, and training the next generation of agribusiness leaders.

- Partnerships (re GDA) – particularly with the potential of leveraging private sector biotech funding.

The Indian agricultural research system is one of the largest in the world, employing about 22,000 scientists and spending slightly less than 0.5 percent of Agricultural Gross Domestic Product (GDP). The World Bank is currently supporting the national agricultural research system with a credit of \$100 and a loan in the amount of \$96.8 million. The Bank has made two previous loans to support Indian agricultural research and several loans to support Indian extension. Whatever USAID does to support research must be a niche of competitive advantage.

Description:

This flexible instrument would help strengthen the links to promote biotechnology research between U.S. and Indian state agricultural universities and between other dynamic public and private sector research institutions in both countries. An umbrella grant program would be instituted which would solicit and fund research proposals developed jointly by U.S. and Indian institutions to do adaptive and applied research on products and services which could move to commercialization within a three to five year period. Participation of a credible, for-profit firm could be required to help ensure the practicality and potential commercialization of research results.

Areas for consideration and further exploration might include (activity might be staged by):

- Public outreach on biotech – building stakeholders, acceptance, and local demand for biotech. There has been much press on biotech in India and there are a diverse set of organized stakeholders ranging from farmers' groups, anti-biotech NGOs, consumer organizations, food industry, and the press. These groups can impact government policy and regulatory decisions: government agencies, in the face of potential backlash to biotech, will often delay regulatory

approvals or place so many restrictions as to make approval too costly. Thus a fruitful point of intervention related to biosafety could be to assist Indian scientists and policy-makers to engage in public outreach to key constituencies such as the media, farmers organizations, and the food industry.

- Biosafety regulatory policy – it is difficult to know what led the GEAC to put off approval of Bt cotton. It could be, however, that lack of confidence in the regulatory science, combined with controversy over biotech, leads governments to make what are perceived to be “safe” political decisions rather than ones based on science. Strengthening the technical capacity of the regulatory bodies, funding of biosafety research related to risk assessment, policy research to highlight implications of the current environment, and sensitization at the political level could help reduce the barriers to biotechnology approvals. The recent report commissioned by the Prime Minister, which was strongly critical of the current regulatory structure, could indicate receptivity within the government for improvement in the Indian biotech regulatory system.
- Collaborative research and crop technology development – while there is a broad and dynamic local biotech research, this would be a fruitful area for collaboration with both U.S. universities and U.S. industry. Targets could include nutritional enhancement (biofortification through a combined biotech and breeding approach – targeting iron and beta-carotene (Vitamin A) and perhaps zinc), stress tolerance (drought, salt, and even cold tolerance – abiotic stresses), insect and disease (biotic) resistance, or focus more on urban and international markets. A range of crops (other than cotton, wheat, rice, maize, and soybeans) might have large potential for collaboration.
- Finally, a collaborative R&D agenda could extend into institutional development issues related to biotech such as technology transfer, public-private sector collaborations, and intellectual property rights management.

Conversations with both the Ministry of Science and Technology (Department of Biotechnology) and the Ministry of Agriculture (ICAR) have indicated a receptivity for collaboration. The Department of Biotechnology has

suggested that the activity begin with a joint Indian/U.S. workshop, to be held as soon as feasible either in India or the U.S. from which an action plan might evolve. They propose that initial participation be primarily by public sector scientists (the multi-national activities are handled by a different “channel”).

Potential U.S. Partner(s): U.S. scientists working in public and private agriculture and food/fiber science research institutions. U.S. public and private resources could be accessed through the Agricultural Biotechnology Project, managed in AID/W (Josette Lewis, CTO of this project, anticipate a visit to India in early December). The Donald Danforth Plant Science Center is another mechanism for accessing public and private U.S. organization is agricultural biotechnology.

Potential Indian Partner(s): Indian scientists working in public and private agricultural and food/fiber science research institutions.

The International Center for Research in the Semi-Arid Tropics (ICRISAT), headquartered in Hyderabad, anticipates developing a Biotech Park that would facilitate start-up private sector activity in agricultural biotechnology. ICRISAT anticipates providing facilities and market advice and guidance. The products of the collaboration would be public goods, with the partners spinning off profit-making products as they matured.

Design Issues: Who would administer the program? The Tata Energy Research Institute (TERI) might be a leading candidate to manage the activity in India. The Indian Council of Agricultural Research (ICAR) in the Ministry of Agriculture and/or The Department of Biotechnology in the Ministry of Science and Technology might be logical GOI sponsoring agencies.

How could commercialization and economic values be best stressed?

How would private sector (especially multi-national companies) be eventually incorporated in the collaboration?

Analytical Template #2**Problem Area:** Technology**Proposed Intervention:** Biotechnology**Total Score :** 98 points**Likelihood of Achieving Demonstrable, Material Impact Within Five Years (15 points out of 20)**

The objectives of a more forthcoming Indian biotechnology policy and producing commercially viable crops are highly likely during the period of the project.

Significance of Impact on Lives of Low Income People, Particularly Women (15 points out of 20)

Numerous low-income people could be expected to be direct recipients of the benefits of biotechnology through increased incomes and improved nutrition. The project could also have significant environmental benefits.

Potential for Cost-Effective Replication Across India (18 points out of 20)

In this case, the question can be stated more specifically: Five years down the road, after the mini network program resources have all been expended, would there be a measurable increase in joint US-India agricultural research funded from other sources? Given the historical predilection of the USG and the GOI to fund only their own domestic research institutes, the result would depend importantly on the success of the project. Given the immense pool of scientific talent in India, after the Indian biotechnology policy is normalized, large amounts of private sector money from both the U.S. and India should be available to finance research directly related to potential commercial opportunities. It is also highly likely that significant GOI funding will be forthcoming.

Strong Indian Institutional Interest and Collaborators (15 points out of 20)

Discussions in India give the impression that many scientists in national agricultural research centers and state agricultural universities would be interested in applying for support under the program. However, special attention would be needed to ensure the notion of relatively rapid commercialization and diffusion across farmer fields or marketing/processing centers is understood and factored into proposals and research protocols. Private sector Indian researchers are interested, but few.

Strong U.S. Institutional Interest and Collaborators (18 points out of 20)

There is very strong interest among the public and private sector research community.

Complementarity with Other USAID/India Programs (8 points out of 10)

Biotech opportunities could significantly complement USAID/India food security, environmental, and health and nutrition investments.

Potential Platform for More Collaborative/GDA-Type Mode of Operation (9 points out of 10)

The program could be designed in such a way to ensure this criteria is fulfilled.

Descriptive Template #3**Problem Area:** Technology**Proposed Intervention:** Scientific Exchanges**Five-Year Objective:** The objective would be to reinvigorate the collaborative research relationship between U.S. and Indian agricultural, food and fiber scientists, perhaps with initial emphasis on biotechnology but considering other topics, as appropriate. It would be measured in terms of number of institutions and scientists involved. Any public or commercial products or services stemming from the research would be an added benefit.**Rationale:** Agricultural science, through the Green Revolution, unlocked the formula that transformed the Indian countryside and made tremendous progress in alleviating hunger and poverty.

Agricultural science is one of the U.S. strengths. The U.S. and India had a strong program of scientific collaboration, dating back to the late 1950s. More recently exchanges have been essentially suspended. Lacking an alternative source of funding for this purpose, the result has been an in-growth of the Indian agricultural science community, especially in the state agricultural universities. This flexible instrument would help re-establish and strengthen links between U.S. and Indian state agricultural universities and between other dynamic public and private sector research institutions in both countries.

Included in the current World Bank credit and loan to India for a National Agricultural Technology Project is a sizable amount for training and workshops including training travel. The GOI has specified that these funds should be used to train Indian scientists. However, the GOI has been slow to activate this component of the loan, according to one source, exploring ways that this part of the investment could be made more productive.

Description: An umbrella grant program would be instituted which would solicit and fund research proposals developed jointly by U.S. and Indian scientists and institutions to do adaptive and applied research on products and services for up to three-year periods that could move to public use within a

three to five year period. Categories would be identified by USAID, the World Bank, and the GOI but might include biotechnology, and if appropriate, other topics supported or contemplated to be supported by USAID/Delhi such as food and agriculture policies, on-farm water management, and agribusiness development (in some situations, these scientific exchanges might serve as bridging mechanisms until a separate project is identified and developed). Primary funding for Indian participants, including travel to the U.S., would come, at least initially, from the agricultural research loan from the World Bank. Primary funding for U.S. participants, consisting of travel and lodging/per diem to India, could come from either monetization of PL 480 commodities or development assistance funds.

Indo/U.S. Agricultural Research Project

The Indo/U.S. Agricultural Research Project (ARP), which operated during 1983-92, might be a model by which to design future Scientific Exchanges.

Overall supervision was carried out by an Indo-U.S. Sub-Commission on Agriculture that met annually.

Funding was for 9 years with the U.S. contributing \$20 million and India \$8 million (in Rs).

The overall project goal was to increase agricultural productivity, production, employment and income. The final evaluation in 1992⁷ concluded that this goal was “obviously” unrealistic and impossible to attain during the ARP’s life span. The final evaluation team did conclude that the project’s purpose, to strengthen the capacity of the Indian agricultural research system in selected key areas was reached. There was no question that the Indo/U.S. Agricultural Research Project had made a significant contribution to the research capability of all sub-projects and pre-projects in which it invested. This was accomplished by building institutional research capacity through collaborative assistance with designated U.S. Land Grant Universities, the U.S. Department of Agriculture, and

⁷ See “Final Evaluation Report: Indo/U.S. Agricultural Research Project, Project Number 386-0470,” IQC contract No. PDC-1406-I-00-0034-00, Delivery Order No. 12, prepared for USAID/India by Drs. Peter van Schaik, Keith Allred, J.S. Kanwar, and C. Krishna Rao, organized by the International Resources Group Ltd, May 1992.

other agricultural organization, and by assisting in the development and transfer of agricultural technology through collaborative research between Indian and U.S. research scientists with cooperation and support from their respective participating institutions. The team found universal agreement that the training and technical exchange opportunities, the assistance provided by U.S. consultants in planning and implementation, and the provision of previously unavailable equipment, had provided the stimulus and means for productive research.

Problem areas were nominated the Indian Council of Agricultural Research (ICAR), reviewed by USAIF/New Delhi, and approved and monitored by the Indo-U.S. Sub-Commission.

An independent organization, in this case Winrock International, provided the management.

Activities began with two sub-projects, Soybean Processing and Utilization and Post Harvest Technology of Fruits and Vegetables, and eventually grew to a total of eight sub-projects and seven pre-projects.⁸

Considering all programs combined, more than 300 Indian scientists spent anywhere from two weeks to 18 months at training locations in the United States. This amounted to 1600 man-months of specialized training wherein these scientists benefited from direct contact with programs of other professionals at locations where teaching and research activities were being conducted in scientific

⁸ Other sub-projects and pre-projects included:
Conversion of Bio-Degradable Animal Wastes
Intracellular Blood Protista
Embryo Transfer Technology
Forest Faculty Training
Agro-Forestry
Agro-Meteorology
Plant Genetic Resources
Farm Equipment Manufacturing Technology Centers
On-Farm Water Management
Protective Cultivation and Greenhouses
Tissue Culture of Horticultural Crops
Integrated Pest Management
Animal Genetics Resource Conservation
Project Implementation Unit

disciplines directly associated with their own areas of interest.

A total of 51 U.S. consultants came to India during the nine-year life span of the ARP, accounting for 115 man-months of consultation, training, and direct contacts. While in India, these scientists interacted with hundreds of agricultural professionals including teachers and researchers.

Considerable state-of-the-art laboratory and field equipment was imported from the United States and elsewhere to provide Indian research scientists the opportunity to conduct agricultural research at the cutting edge of their scientific specialities.

The research results, research products, and, beyond that, possible commercialization of any developed products varied greatly from program to program. In seven pre-projects the ARP contribution was limited in funds and time and only some training, consultation, and equipment could be provided. On the other hand, the pre-project on plant germplasm conservation led to a major stand-alone project in support of India's plant germplasm conservation and exploration activities benefited worldwide efforts in this field. The Forestry Faculty Training sub-project trained a large number of scientists in a short time to establish forestry research and education capability at 14 agricultural universities. The sub-projects with accomplishments of greatest commercial potential were Soybean Processing and Utilization with several processes and products developed; Post-Harvest Technology, with several promising techniques and products; Blood Protista, with one commercially produced vaccine; and the Conversion of Biodegradable Animal Wastes for animal feed with processes for recovering animal feed ingredients from slaughterhouses, as well as poultry and fisheries operations.

The success of the ARP was to a considerable extent due to the fact that all projects were in areas of research in which the ICAR had considerable ongoing activities. Many of these priority projects formed an important part of the coordinated all-India networks of research. Sustainability, in the form of continued India funding, appeared to be assured for the immediate future.

The review team heard repeated pleas for some form of limited but continued U.S. involvement, particularly in the areas of consultant's participation in program planning and review and the availability of some foreign exchange for purchase of urgently needed repair parts for imported equipment.

The review team concluded that the concerns for the future lay not so much in India's agricultural research capability but in its ability to translate research results into useful, adoptable practices, processes, and products.

Potential U.S. Partner(s): U.S. scientists working in public and private agriculture and food/fiber science research institutions. Particular emphasis could be given to agricultural scientists at the U.S. land grant universities with traditional relationships with Indian state agricultural universities: Illinois, Kansas State, Missouri, Ohio State, Pennsylvania State, and Tennessee.

Potential Indian Partner(s): Indian scientists working in public and private agricultural and food/fiber science research institutions. Particular emphasis could be given to agricultural scientists at the Indian state agricultural universities with traditional relationships with U.S. land grant universities: Andhra Pradesh, Haryana, Madhya Pradesh, Maharashtra, Karnataka, Orissa, Punjab, Rajasthan, Tamil Nadu, and Uttar Pradesh.

Design Issues: Who would administer the grant program? USDA or Danforth Foundation (for biotechnology exchanges) might be considered on the U.S. side and the Tata Energy Research Institute (TERI) might be a possible Indian candidate (at least for the biotechnology component). The U.S. land grant universities and Indian state agricultural universities with traditional relationships might be consulted during design and administration. The Indian Council of Agricultural Research (ICAR) in the Ministry of Agriculture might be the logical GOI sponsoring agency.

How would funding from different sources – World Bank and USAID – be coordinated?

How could performance be best stressed and evaluated?

Analytical Template #3**Line of Inquiry:** Technology**Proposed Intervention:** Scientific Exchanges**Total Score: 73 points****Likelihood of Achieving Demonstrable, Material Impact Within Five Years (10 points out of 20)**

The objective of reinvigorating joint US-Indian collaboration in agricultural research activities would begin to be realized from the moment proponents in the two countries began work on their respective proposals. The results would certainly be demonstrable but it is more difficult to say to what extent this collaboration could be called material, that is, resulting in technologies or other products that might directly benefit the poor within the projected five-year period.

Significance of Impact on Lives of Low Income People, Particularly Women (8 points out of 20)

The projected five-year time period is very short to expect scientific results that would benefit low-income people as direct recipients of the scientific exchanges during the designated period. The poor might, to some extent, benefit from research completed by program participants, but the significance of any such impact during the five-year period is difficult to estimate. If the program catches on and especially if it bridges into support for state agricultural universities, the impact could be much greater.

Potential for Cost-Effective Replication Across India (6 points out of 20)

In this case, the question can be stated more specifically: Five years down the road, after the scientific exchange program resources have all been expended, would there be a measurable increase in joint US-India agricultural research funded from other sources? Given the historical predeliction of the USG and the GOI to fund only their own domestic research institutes, it is difficult to project that there would be any such increase in public funding. It is possible that private sector money, primarily from the U.S. might be available to finance research directly related to potential commercial opportunities.

Strong Indian Institutional Interest and Collaborators (15 points out of 20)

Discussions in India give the strong impression that many scientists in national agricultural research centers and state agricultural universities would be interested in applying for support under the program. However, special attention would be needed to ensure the notion of relatively rapid commercialization and diffusion across farmer fields or marketing/processing centers is understood and factored into proposals and research

protocols. Private sector Indian researchers should be interested, although we have not investigated extent.

Strong U.S. Institutional Interest and Collaborators (20 points out of 20)

There is strong interest among the public and private sector research community, particularly among the land grant universities with traditional relationships with Indian state agricultural universities. This activity would have very strong political support.

Complementarity with Other USAID/India Programs (5 points out of 10)

Certain biotech opportunities could significantly complement USAID/India food security investments. Categories could be extended to cover other agricultural topics with relationships to other USAID/India programs, particularly nutrition and environment.

Potential Platform for More Collaborative/GDA-Type Mode of Operation (9 points out of 10)

The program could be designed in such a way to ensure this criterion is encouraged.

Descriptive Template #4**Problem Area:** Technology**Proposed Intervention:** State Agricultural University Development

Five-Year Objective: The objective would be to reinvigorate selective Indian state agricultural universities that had their origins in the 1960s and 70s and benefited from collaboration with U.S. land-grant universities. These universities had, and still have, a major role in developing the technologies that became known as the Green Revolution with immense benefit to alleviating poverty and hunger in India. It would be measured in terms of number of institutions and scientists involved. Any public or commercial products or services stemming from the research would be added benefits.

Rationale: Agricultural science, through the Green Revolution, unlocked the formula that transformed the Indian countryside and made tremendous progress in alleviating hunger and poverty.

Agricultural science is one of the U.S. strengths. The U.S. and India had a strong program of scientific collaboration, dating back to the late 1950s. That collaboration came to an end some twenty years ago. Lacking this intellectual stimulation and funding for this purpose, the result has been a loss of vigor and an in-growing of the Indian agricultural science community, especially in the state agricultural universities

The World Bank currently has a loan for support to selected state universities. It will be carrying out a final assessment during the period November 19 – December 10, with the objective of preparing a follow-on loan.

Included in the current World Bank credit and loan to India for a National Agricultural Technology Project is a sizable amount for training and workshops including training travel. The GOI has specified that these funds should be used to train Indian scientists. However, the GOI has been slow to activate this component of the loan, according to one source, exploring ways that this part of the investment could be made more productive.

U.S. interventions with the State Agricultural Universities SAUs began with the appointment of Americans to the University Education Commission, formed in 1948, which called for the creation of a system of “new rural colleges and universities, with freedom to create a distinctive tradition as to purposes, spirit, and methods.” In 1949 the University Education Commission recommended adoption of the U.S. Land Grant University philosophy. The first joint Indo-American team in 1955 recommended where possible each state should develop an agricultural university. The second joint Indo-American team in 1960 recommended basic principles such as 1) autonomous status, 2) location of agricultural, veterinary science, home science, technological and science colleges on the same campus, 3) integration of teaching to provide a composite course for all students, and 4) integration of teaching, research, and extension. The Cummings Committee report in 1962 recommended to the Indian council of Agricultural Research (ICAR) that the blue print on organization and operation of agricultural universities drawn up by Dr. H.W. Hanah of the University of Illinois be adopted. This blue print was adopted with necessary changes to adapt it to the Indian situation.

The ultimate goal of the state agricultural universities was to provide well-trained manpower needed to give sound scientific and technological base to India’s agriculture – in order to accelerate the pace of agricultural development and social transformation. The stated mission of the SAUs is three-fold:

- To impart education in branches of agriculture and allied sciences;
- To farther the advancement of learning and prosecution of research in agriculture and allied sciences; and
- To undertake the extension of information and development through research to rural people.

Ultimately all agricultural research from state departments of agriculture was transferred to the universities. This made possible the integration of teaching and research in the universities. However, the states were slower in turning over the extension education function to the universities, a process that to this day, has not been completed.

Beginning in 1960 with the establishment of G.B. Pant University of Agricultural Science and Technology in Uttar Pradesh, 26 state agricultural universities have been established with either the semester or trimester system, internal grading as in the United States, and the triple functions of research, teaching and extension in the universities.

The basic philosophy of the SAUs is to serve the farmer. However, although all of the universities have the same function and similar organization structures, each is different from the other, with its own unique set of strengths and weaknesses its own world class vs. weaker colleges and departments, its own peaks and valleys of excellence.

- Each university has had a different series of Vice Chancellors, with different backgrounds and experience in agriculture, education and administration. Directors, deans, and department heads from one university to another have had varying types and levels of training experience and administration know-how and skills. Some departments have developed strong programs, others are weak. Leadership and technical skills of faculty members of the same discipline vary from one university to another.
- The administrative set-up has had significant variations from one university to another. For example, while most are organized along traditional college and departmental lines, others are organized along traditional college and department lines, others are organized along interdisciplinary lines such as crop protection, horticultural crops. Etc. Some have allowed departments to proliferate into, one for almost every discipline in order to create appointments of more “professor” positions. Others have developed a system for promotion to professor without relation to administrative duties.
- Some are the only agricultural university in the state. Some are only one of several. Some have large acreages of land for research and seed production. Others are limited. Some have colleges at several campuses. Others are all on one campus. Each has a different combination of regional research stations and sub-stations. Each has a somewhat different, though similar, combination of “extension activities.

The SAUs produce about 60 percent of the 10,000 B.Sc. graduates in the country each year. These graduates man the state development departments, cooperatives, and banks engaged in improving agriculture as well as the tops positions in the farm-input supply industries.

The SAUs produce practically all of the MScs and share with the Indian Agricultural Research Institute (IARI) in the production of PhDs necessary to do the higher-level of scientific research and training in the country. They have become a full partner with ICAR in conducting agricultural research.

Through their extension wings, they have become important partners with the state departments of agriculture for disseminating new technologies to farmers. They regularly train state extension personnel, and transmit research needs back to the university.

Soon after, as part of the original Point Four Program, the U.S. offered to assist India in the development of a system of agricultural universities. During the next twenty years, the six Land Grant Universities of Illinois, Kansas, Missouri, Ohio, Pennsylvania, and Tennessee entered into agreements to develop nine agricultural universities in India. Others received limited help from USAID, help from other donors, or were established entirely with Indian funds and technical help. During that twenty years of cooperation, some 337 U.S. faculty members were assigned to posts in India. At the same time, more than 1,000 Indian students received M.S. or PhD degrees from these same U.S. universities.

It is clear the SAUs have earned a very important leadership role in the development of agriculture and the rural economies of the states. It is also clear that, partly as a result of the withdrawal of U.S. support, a number of concerns have developed:

- Faculty isolation is a key problem and source of frustration. It is difficult for most faculty members to engage in significant travel within India for professional enhancement and virtually impossible for most to engage in international collaboration.

- Current information is extremely difficult to acquire, particularly in rapidly evolving research areas. Library resources are generally meager and are not connected to each other via modem communications systems. Linkages to computer data bases are not available. Faculty have little opportunity to travel and obtain current information directly.
- There is some concern within the country regarding the ability of government-supported research establishment to deliver the goods in terms of actual implementation of improved technology in the marketplace. While there have been numerous successes such as the relatively widespread adoption of the technologies leading to the Green Revolution, recent reviews and evaluations have concluded that with the priority given to education, science, and technology within India, substantially greater progress should be made. Lack of linkages between the public sector research institutions and potential users of new technology in the private sector are frequently noted as a weakness needing correction.

Description:

This activity could proceed in either of two ways:

- USAID could collaborate with the World Bank in designing the follow-on World Bank loan support to Indian state agricultural universities, with the objective of USAID providing a grant technical collaboration component from U.S. land grant universities.
- USAID could design a stand-alone activity to re-activate scientific collaboration and training for selected state agricultural universities.

Either way, an umbrella grant program would be instituted which would solicit and fund research proposals developed jointly by U.S. and Indian scientists and institutions to do adaptive and applied research on products and services for up to three-year periods that could move to public use within a three to five year period. If the joint World Bank/USAID route were followed, primary funding for Indian participants, including travel to the U.S., would come, at least initially, from the agricultural research loan from the World Bank and primary funding for U.S. participants, consisting of salaries, travel and lodging/per

diem to India, could come from either monetization of PL 480 commodities or, more probably, development assistance funds.

Potential U.S. Partner(s): U.S. scientists working in public and private agriculture and food/fiber science research institutions. Particular emphasis would be given to agricultural scientists at the U.S. land grant universities with traditional relationships with Indian state agricultural universities: Illinois, Kansas State, Missouri, Ohio State, Pennsylvania State, and Tennessee.

Potential Indian Partner(s): Indian scientists working in public and private agricultural and food/fiber science research institutions. Particular emphasis would be given to agricultural scientists at the Indian state agricultural universities with traditional relationships with U.S. land grant universities: Andhra Pradesh, Haryana, Madhya Pradesh, Maharashtra, Kanataka, Orissa, Punjab, Rajasthan, Tamil Nadu, and Uttar Pradesh.

Design Issues: Who would administer the grant program? The U.S. land grant universities and Indian state agricultural universities with traditional relationships might be consulted during design and administration. The Indian Council of Agricultural Research (ICAR) in the Ministry of Agriculture might be the logical GOI sponsoring agency.

How would funding from different sources – World Bank and USAID – be coordinated?

How could performance be best stressed and evaluated?

Analytical Template #4**Line of Inquiry:** Technology**Proposed Intervention:** State Agricultural Universities**Total Score : 69 points****Likelihood of Achieving Demonstrable, Material Impact Within Five Years (10 points out of 20)**

The objective of reinvigorating selective state agricultural universities would begin to be realized from the moment proponents of the two countries began to collaborate. The Results would certainly be demonstrable but it is more difficult to say to what extent this collaboration could be called material, that is, resulting in technologies or other products that might directly benefit the poor, within the projected five-year period. The project should have a longer projected life in order to be fully effective.

Significance of Impact on Lives of Low Income People, Particularly Women (8 points out of 20)

The projected five-year time period is very short to expect results that would benefit low-income people as direct recipients of the university strengthening during the designated period. The poor might, to some extent, benefit from research completed by program participants, but the significance of any such impact is difficult to estimate.

Potential for Cost-Effective Replication Across India (10 points out of 20)

This result is difficult to predict. Without U.S. support, Indian support has dropped of with resulting weaknesses in Indian agricultural development. Hopefully, the contribution of the state agricultural universities could be brought back to the recognition of public opinion with the greater visibility of U.S. support.

Strong Indian Institutional Interest and Collaborators (15 points out of 20)

Discussions in India give the strong impression that many scientists in national agricultural research centers and state agricultural universities would be interested in applying for support under the program. However, special attention would be needed to ensure the notion of relatively rapid commercialization and diffusion across farmer fields or marketing/processing centers is understood and factored into proposals and research protocols. Private sector Indian researchers are interested, but few.

Strong U.S. Institutional Interest and Collaborators (16 points out of 20)

There is strong interest among the public and private sector research community.

Complementarity with Other USAID/India Programs (5 points out of 10)

Certain scientific exchanges could significantly complement USAID/India food security investments.

Potential Platform for More Collaborative/GDA-Type Mode of Operation (5 points out of 10)

It is anticipated that U.S. universities, and perhaps India private sector activities, might contribute their own resources.

Descriptive Template #5

- Problem Area:** Agricultural market distortions
- Proposed Intervention:** Policy analysis to reduce legal and regulatory disincentives to agri-business investment
- Five-Year Objective:** To reduce disincentives to the entry or expansion of agri-business enterprises and reduce transaction costs in agricultural markets. Achievement of these objectives would be measured by the number of new entrants in the agribusiness sector, increased efficiency in agricultural markets, greater demand for agricultural produce at the farm level and higher farm gate prices.
- Rationale:** Current legislation and regulation create disincentives in the form of burdensome taxes and levies on potential agribusiness investors. This results in under-investment in the agri-business sector, higher prices to consumers for agricultural products and lower payments to farmers for their produce. Policy analysis is needed to identify and propose reforms leading to a business environment that is conducive to agri-business formation, investment and market efficiency.
- Description:** U.S. universities and international public research organizations would compete for grants to conduct research on market efficiency, organization and incentive structures. Institutional capacity building would also form a component of these grants. Cooperative agreements would be awarded to private sector partners who would focus primarily on incentive structures, legal and regulatory frameworks. Private sector partners would be used to evaluate the public sector analyses and the recommendations forthcoming.
- Potential U.S. Partner(s):** University and private sector agricultural marketing and agri-business specialists.
- Potential Indian Partner(s):** Indian agricultural policy researchers in public institutions including the Ministry of Agriculture's Department of Food Processing Industries, and the Ministry of Commerce's Agricultural and Processed Food Products Export Development Authority (APEDA), as well as private sector producer associations, e.g. the India Fresh Fruit Alliance,

the West and Southern India Floriculture Associations, and others yet to be identified.

Design Issues:

Commercialization of research results would be stressed through a dialectical process involving the public and private sector participants. Public sector analyses and recommendations would be contrasted with the views of and, indeed, criticized by the private sector participants and vice-versa, thereby interjecting both a sense of realism and practicality into results that might otherwise be perceived as either too theoretical or too concessional to business interests.

Competitive grants would be awarded by a technical review committee comprised of USAID/New Delhi staff and selected consultants with assistance from USAID/Washington, if deemed desirable. As this research would largely be conducted in-country, grants would be administered by a designated AO at USAID/New Delhi. In the case of cooperative agreements entailing primarily review and critique of legal and regulatory practise and the forthcoming public research recommendations, work could be administered by an AO from an appropriate office in USAID/Washington.

Analytical Template #5

Problem Area:	Agricultural market distortions
Proposed Intervention:	Policy analysis on reducing legal and regulatory disincentives to agri-business investment
Total Score :	81 points

Likelihood of Achieving Demonstrable, Material Impact Within Five Years (10 points out of 20)

It is clear that the policy research envisioned can be completed within the given time period, as well as substantial human capacity built. The time frame is also long enough for this human capacity to begin influencing Indian legislative and regulatory governance of agri-business. A significant determinant of the material impact of this activity will be favorable changes in market demand and prices, both, at present outside the sphere of influence of this activity. However, other, complementary activities proposed as components of the general agricultural strategy focus on influencing market demand and prices (see templates “Agricultural Markets Development” and “Agricultural Technology”).

Significance of Impact on Lives of Low Income People, Particularly Women (12 points out of 20)

To the extent that reforms are enacted, growth in agro-industrial processing will immediately lead to on-farm and wage labor opportunities. It is anticipated that, given their predominance in farm level production, women will derive substantial benefit. Furthermore, activity design can consciously direct benefits to women by working with self-help groups and the cooperative structure.

Potential for Cost-Effective Replication Across India (15 points out of 20)

Reform measures will extend to the country as a whole, although impact will be differential depending on the nature and importance of agriculture to the individual state economy. States with higher vegetable and fruit production could be expected to reap greater benefits than grain producing areas. Infrastructure and bureaucratic efficiency will also undoubtedly vary by state, either accelerating or retarding the rate at which market development takes place.

Strong Indian Institutional Interest and Collaborators (15 points out of 20)

There is strong interest among the private sector agri-business community and key public sector offices responsible for agricultural market development.

Strong U.S. Institutional Interest and Collaborators (15 points out of 20)

Although interest has yet to be solicited, the U.S. has superlative capabilities in agri-business and market development that could be tapped. This would include the Emerging Markets Division of USAID/G/EGAD, cooperative organizations, university faculties and private sector companies.

Complementarity with Other USAID/India Programs (7 points out of 10)

With 25% of India's current GDP derived from agriculture, investment in agri-business policy would be highly complementary to USAID/India's commitments to expanding economic growth and improving food security. Agri-business policy reform is a prerequisite for increased private sector investment in India's agricultural sector. Without needed policy reforms, economic growth will be slower and rural unemployment, poverty and food insecurity higher.

**Potential Platform for More Collaborative/GDA-Type (7 points out of 10)
Mode of Operation**

By right of its private sector nature, this program area offers significant scope for developing unique public/private sector partnerships between Indian and U.S. institutions. The sheer size of the Indian market and its potential should also serve as a tremendous incentive for private sector involvement.

Descriptive Template #6

- Problem Area:** Agricultural market distortions
- Proposed Intervention:** Horticultural Market Development
- Five-Year Objective:** The objective of this activity would be two-fold:
- i) to improve the quality of produce at all levels of the marketing system - from the farm through to the processor or consumer - implicitly reducing wastage in the course of marketing; and,
 - ii) to increase the percentage of India's fruit and vegetables that are processed.

Success of the activity would be measured by reduced losses on-farm and in transit, improvements in produce quality and uniformity, greater farmer recognition of produce standards and increased processing of horticultural produce.

- Rationale:** Urbanization, wastage, changing consumption patterns, medium-term results. Returns to the poor.

India is the world's second largest producer of fruit and vegetables, yet only an estimated 2% of this produce is processed in any way prior to marketing (Rabobank, 1999). The vast bulk of this produce is grown on smallholder plots. Marketing entails complex networks of middlemen, with often as many as seven levels of handling before reaching the consumer. These middlemen add little if anything in the way of value to the produce, apart from their own margins (G. Venkataramani, pers. comm., 2001). Delivery to market is generally in bulk shipment by road resulting in 30% losses due to wastage. These losses amount to more than just food that will never reach the tables of the poor: to the Indian economy, they also represent foregone income and employment. Rapid urbanization in the country is expected to increase demand for these commodities, thereby adding to their value.

The problems of India's horticultural producers in marketing quality fruit and vegetables can be addressed by USAID-supported technical assistance, delivered through the proposed multi-functional agri-business facility. Historical evidence supports this argument. USAID/India's

Agricultural Commercialization Enterprise (ACE) project was highly successful in removing the financial bottlenecks impeding the horticultural industry. It was, however, judged not to have performed as well in furnishing the technical assistance required by the sector (RAI, 1995). Unfortunately, the ACE project ended prematurely before such issues could be fully redressed. Nevertheless, it laid a solid foundation for India's horticultural sector. The above figures on processing and wastage are evidence, however, that India's horticultural markets could benefit from further assistance.

In addition to reducing wastage, processing of one's produce also allows one to take advantage of higher prices in distant markets. It also stabilizes markets by reducing wide price swings associated with gluts and deficits in local markets. Because processing typically concentrates a product, more raw product is required as inputs, thereby stimulating local production and increasing household income and employment.

Poor quality and non-standardized produce, however, restrict mechanized processing and result in inferior final products. In turn, inferior product quality limits access to higher value markets for both processors and farmers. Interviews with private entrepreneurs suggest that they have neither the technical know-how nor the resources to work with individual farmers to acquire the quality raw product needed as the basis for a processing industry. Thus, issues of poor quality and lack of standardization dissuade private sector investment in fruit and vegetable processing.

Description:

Organizing horticultural marketing systems to add value to horticultural produce

A multi-functional agri-business facility working in selected states building capacity within and linkages between horticultural producers, processors and markets. Interventions would take the form of technical assistance in conducting market studies/assessments, advice on product development, processing or storage, institutionalization of grades and standards to ensure product quality, development of business or financial plans, and assistance in obtaining loans through commercial lenders. As technical needs can be expected to vary by applicant, the

proposed facility would offer a wide range of services to meet the needs of businesses - including cooperatives - that wish to invest in new horticultural enterprises, as well as those already operating in the sector but looking to improve or expand. Contracts will be competed by and awarded to a pre-determined number of qualified Indian or multi-national firms to manage the activities. One award will be made for each state selected as a target area. As envisioned, technical assistance would comprise identification of quality assurance issues starting at the farm level and extending to the post-harvest and marketing or processing stage. It will entail problem definition and identification of appropriate technical solutions, ranging from quality seed, grading, storage, shipping materials, provision of cold chain, and information technology . The proposed facility will also provide information on product markets and facilitate producer-market linkages.

Non-Indian grantees will be expected to partner with national institutions or organizations

Potential U.S. Partner(s): This may be any number of private sector or cooperative organizations specializing in agri-business or agricultural commodity marketing and development.

Potential Indian Partner(s): A number of national and multi-national management firms exist in India that would be capable partners in this activity. ICICI, a national firm previously involved in the ACE project, has already expressed keen interest in a follow-on activity. Indian public institutions, specifically the Department of Food Processing Industries, the Agricultural and Processed Food Products Export Development Authority (APEDA), and, the Federation of Indian Chambers of Commerce and Industry (FICCI) have all expressed interest in collaborating with USAID in these areas and could make significant contributions in building market linkages. They could as well become future facilitating institutions.

Other Indian partners would potentially include cooperatives, self-help associations, producers associations and the state extension service.

Design Issues: Because of the envisioned extent of this activity, management responsibility would rest with a Contracts Officer based at USAID/New Delhi. This individual would

also serve the function of liaison or “intermediary” between Indian government partners and the private sector managers.

Based on discussions with previous participants in USAID/India’s ACE project, chances of successful agri-business start-up’s could be improved through careful pre-screening of candidates. Management award recipients would therefore benefit from workshops on the lessons learned during the ACE project, prior to undertaking support activities and particularly where financial support might be required.

Private sector participants should be evaluated for their interest and commitment to succeeding on commercial market terms. Although public institutional partners would be anticipated – and welcomed – it should be clear to all that the purpose of the agri-business facility is to foster economically independent and viable commercial firms. Finance, though perhaps made on soft terms, must not be perceived as grant funds, and interest rates should be generally in line with commercial rates.

Analytical Template #6**Problem Area:** Agricultural market distortions**Proposed Intervention:** Horticultural market development**Total Score :** 79 points**Likelihood of Achieving Demonstrable, Material Impact Within Five Years (13 points out of 20)**

Where business start-up is completely from ground zero, material impact may be slower to materialize, however, given the perceived potential for increasing marketing efficiency, even new start-up's could show surprising results. Greatest potential for early returns exists with firms or agricultural enterprises now in operation but looking to expand or diversify their markets but having difficulty in identifying clients, finance, etc.

Significance of Impact on Lives of Low Income People, Particularly Women (12 points out of 20)

Based on limited interviews with agro-processors, women are major beneficiaries of agriculturally-related investments. For example, the Managing Director of Deccan Florabase, one of the activities funded through ACE, stated that 40% of the workforce at this new enterprise were rural women.

Potential for Cost-Effective Replication Across India (10 points out of 20)

Management will be most effectively organized by selection of qualified local companies. Should it be deemed that no bidders are suitably qualified to manage the facility for a particular state, it is recommended that no activities be undertaken there. It is more difficult to predict how individual firms will perform. As mentioned previously, review of past performance has revealed careful pre-selection of applicants to be a major determinant of outcome. It is also known that agricultural production and marketing performance has historically been uneven across states. Thus, replicability will depend on suitably qualified activity managers, the commitment of the individual firms involved and unique state-associated conditions.

Strong Indian Institutional Interest and Collaborators (12 points out of 20)

There has been strong interest expressed in this type of activity from GOI officials, private sector management organizations and agri-business entrepreneurs.

Strong U.S. Institutional Interest and Collaborators (14 points out of 20)

Emphasis on market development and its associated requirements, e.g. micro-finance, is strong within the present USAID administration and there are already programs and

funding in place to support activities in this area. It is therefore anticipated that interest in developing an agri-business facility would be substantial. There is almost unparalleled expertise in the U.S. public and private sectors in agri-business development and it is highly probable that this activity would attract their interest.

Complementarity with Other USAID/India Programs (8 points out of 10)

With its potential for stimulating the rural economy, creating employment and generating income, there are numerous linkages to USAID/India's programs in economic development, food security, nutrition and health.

**Potential Platform for More Collaborative/GDA-Type (10 points out of 10)
Mode of Operation**

This particular activity could easily be designed to completely fulfill this criteria.

Descriptive Template #7

Problem Area:	Inadequate Rural Access to Information
Proposed Intervention:	Information & Communication Technology (ICT)
Five-Year Objective:	Support the establishment of ICT networks in rural areas that are demand driven, providing information, analysis and technical advice on topics relevant to the particular locale. Success will be measured by the number of ICT centers established, traffic of client usage, private sector collaboration, user payment for services, and sustainability. This initiative will compliment the Economic Growth team's program in Information Technology.
Rationale:	<p>The ICT revolution is already underway in India, and will invariably reach the rural sector with or without USAID assistance. The Indian government, private sector and NGOs are already operating various models/pilots in rural areas. The value USAID adds is by helping hasten the process through an infusion of funds and cutting-edge technology, providing content and direction that specifically addresses the rural poor, and providing coverage to areas that may be overlooked.</p> <p>The U.S. is the world leader in ICT and as such is well suited to lend assistance in this area. Already many collaborative ICT type initiatives between U.S. based interests and their Indian counterparts exist/are being planned. By investing, USAID can ensure that its core objectives (including agricultural development) are promoted through ICT – a medium with the potential to reach a wide spectrum of clientele and beneficiaries.</p> <p>Under the EG program a number of ICT initiatives encompassing policy regulation, workshops, and telecenters have been proposed. The proposed agriculture ICT initiative would fit perfectly with EG program – especially the work on telecenters.</p>
Description:	ICT encompasses speed, quality and precision. In the provision of services to the agricultural sector, it had the advantage of: providing the information using the latest technology that can be updated immediately, having operating costs that are lower than human resources, potential for translating message in many languages, be interactive providing feedback, and use of multimedia and

virtual reality programs that is capable captivating an audience for message dissemination.

A clearly lacking service in India is the accessibility to market analysis that forecasts agricultural conditions -- taking into account weather, prices, demand & supply, global conditions, WTO regulations, phytosanitation, and a host of other factors that help farmers plan. This initiative would help establish such capacity for dissemination through ICT. The USDA is also a potential partner in this component of the program.

The agriculture ICT program would link the farmer, research, marketing, and extension (government and private) to each other into local, national and global networks. It would include market information, production planning, on-farm and post-harvest management and value addition, e-contracting, market intelligence and analysis. Clients would include small-scale subsistence farmers as well as larger commercial farmers eyeing larger markets.

The lessons learned from ongoing pilot Rural Kiosks have shown that farmers demand information on agriculture bundled together with that of other issue concerning their daily lives (e.g. health, government entitlement programs). In certain cases, the rural communities have absorbed the costs of operating these kiosks through user-fees, and donation of buildings and labor.

The proposed ICT initiative would provide connectivity (deployment of technologies to enable rural families to gain access to the internet at a reasonable bandwidth), and content (the substance of the message and its relevance to farming families). This program would introduce new and innovative ICT applications in pilot projects that can then be picked up by the GOI for wider dissemination.

Potential US Partner(s): U.S. universities, USDA, research/technical institutes, Private sector, foundations etc.

Potential Indian Partner(s): The National Institute of Agricultural Extension Management (MANAGE), ICRISAT, NGOs such as the M.S. Swaminathan Foundation, and others identified under the EG group's ICT program.

Design Issues:

Ensure USAID involvement does not act as disincentive for private sector entry.

Compliment rather than duplicate work done by the other donors.

Provision of content that's been distilled to a consistent, clear message.

Location specific content relating to: language, cropping patterns, government programs etc.

Establishment of professionally and competently staffed nodes/centers (at the block or similar level) that compile information for dissemination to the villages.

Analytical Template #7**Problem Area:** Inadequate Rural Access to Information**Proposed Intervention:** Information & Communication Technology (ICT)**Total Score:** **88 points****Likelihood of Achieving Demonstrable Material Impact Within Five Years (15 points out of 20)**

Very high. This is a rapidly evolving field in which capacity is increasing as costs decrease. In an equally fast changing free market environment at the national and global levels, rural farmers stand to gain significantly with access to information on that will help them plan, marketing, mitigate risk, obtain credit etc.

Significance of Impact on Lives of Low Income People, Particularly Women (12 points out of 20)

High. Pilot Information Kiosks have demonstrated that women use it get the price of grain (a medium in which they are paid for labor) and to form credit groups. ICT helps break the barriers to information that women usually face due to cultures mores and norms. The poor in general are able to access information that may have been privy to only the well-connected. However, a certain basic level of education is necessary to fully exploit ICT, and the poor also tend to be least educated.

Potential for Cost-Effective Replication Across India (15 points out of 20)

Very High. One of the strengths of ICT is that can easily be replicated at low costs. Success however will ultimately depend on these systems being able to provide content that's relevant to the individual user – who in India come from immensely diverse regions with varied cultures, climate, local governments etc.

Strong Indian Institutional Interest and Collaborators (15 points out of 20)

High. Many Indian institution including the government and the private sector are already involved in this area. All indications are that they would welcome US collaboration and infusion of technical know-how.

Strong U.S. Institutional Interest and Collaborators (12 points out of 20)

High. The USDA, private corporations, universities and the NGO community all have experience in this area and are eager to get involved in India.

Complementarity with Other USAID/India Programs (10 points out of 10)

Very high. The Economic Growth team already has some initiatives in the works, and the inclusion of agriculture specific content/activities would be a natural fit.

Potential Platform for More Collaborative/GDA-Type (8 points out of 10)
Mode of Operation

Very high. Many of the entrepreneurs who made their millions in the ICT field in the U.S. are of Indian origin, and are interested in re-engaging with India for altruistic and commercial reason. A number are already active in-country. In addition, viewing the growth potential of this sector in India, many multinational corporation will be interested in engagement.

Descriptive Template #8**Problem Area:** Water Scarcity**Proposed Intervention:** Electricity Price Reforms**Five-Year Objective:** Use U.S. expertise to assist liberalized states with an enabling environment to implement state regulatory reforms, including electricity price reforms servicing the agriculture sector. This would closely tie-in with the USAID/India Energy/Environment group's work on the Water-Energy Nexus activity. Success would be measured by the degree to which electricity use by the farmers is quantified and priced.**Rationale:** Agriculture accounts for 30% of electricity use. Electricity – which is controlled at the state level - is sold to agriculture significantly below cost of production. This leads to fiscal short falls for the state electricity boards (and for state governments that prop-up these utility companies). This in turn results in unreliable electricity service to farmers due to inadequate investment in technology and hardware. As a consequence, the farmers maximizing water pumping during the limited number of hours power is available, without regard for actual need. The electricity boards are further disadvantaged by the practice of charging a flat rate, thus encouraging large withdrawals at no surcharge. i.e. the marginal cost of pumping is zero. Studies have shown that farmers are willing to pay higher premiums for irrigation electricity on the condition that the supply is reliable. Reform in this area will remove these distortions and make reliable power available.

World Bank and other studies have cast doubt on the extents that current electricity subsidies help the poor farmers. For instance in Haryana, electric pump owners had one-third higher incomes than that of average farmers. Due to the regressive flat-rate tariffs, marginal farmers who own pumps pay 13% gross income toward tariffs while the corresponding figure for the large farmers is only 6%. In addition, unreliable, low quality power resulted in pump damage and disruptions in the irrigation schedule leading to production losses.

Reform in this area is caught in a Catch-22 situation where: the farmer is willing to pay market prices only if the

electricity supply is consistent and reliable, while the utility company can only provide such service if they are paid by the farmers.

Reforms in this area would benefit the poor in the medium to long term. It would enable the utility companies to provide wider service to those who currently do not have electricity connection and thus are unable to pump water. It should also conserve water (though this will have to be closely monitored). It would also reduce costs for the farmers who use water efficiently. Finally, it would enable the utility companies to remain solvent and continue to provide electricity for irrigation

Description:

USAID assistance could help break this quagmire. The implementation of pump metering programs to enable the measuring and valuation of water use will be promoted. Many of the utility companies are already at various stages of this activity. Pilot program(s) that look at the entire system – from the perspectives of the utility company and the farmer – will be implemented. The World Bank has a few irrigation projects (including a water-management project in UP that's about to be started) and USAID could provide complimentary grant assistance and bring in technical expertise from states such as California. Central to reform is the changing farmer perception that subsidized power for water is an entitlement. Pricing of power for irrigation will also be influenced by the prevailing pricing policy for surface water. Attention has to be placed to build a targeted safety net program that would capture the poor farmers who are unable to pay higher rates of tariffs during the transitional period of the reforms.

Potential US Partner(s): Universities, USEA, WB, ADB, DIFID & other donors

Potential Indian Partner(s): Utility companies, regulatory boards, state governments, NGO's, farmer assoc, and Water-Energy Nexus partners

Design Issues:

Safety nets for water purchasers.

Pay attention to prevailing canal irrigation water prices when designing electricity price schemes.

Our partners – they would have to be those who have what it takes to tackle this contentious issue.

Analytical Template #8

Problem Area: Water Scarcity

Proposed Intervention: Irrigation Power Pricing Reforms

Total Score: 80 points

Likelihood of Achieving Demonstrable Material Impact Within Five Years (10 points out of 20)

An intervention that falls into a relatively ‘high-risk/high-pay off’ category. Vested interests and farmer perceptions are obstacles to tariff reforms. However, the utility companies and local governments realize that they will go broke unless the costs for supplying irrigation power can be recuperated.

Significance of Impact on Lives of Low Income People, Particularly Women (14 points out of 20)

Since it’s been shown that small landowners with pumps pay a greater share of their incomes as tariffs under the current scheme than their larger counterparts, progressive tariff reforms will help level the playing field. However, farmers who purchase water from the large farm owners – including those who are too poor to own pumps – are likely to get adversely affected by tariff reforms.

Potential for Cost-Effective Replication Across India (10 points out of 20)

Medium potential for replication across the country. Institutional will for reform is necessary in-spite of opposition from various interest groups. However, if a successful program is to be implemented, it will be valuable ammunition for officials pushing for reform across the country.

Strong Indian Institutional Interest and Collaborators (13 points out of 20)

Utility companies would be very interested in collaboration. So would policy makers at the national level, and donors such as the World Bank.

Strong U.S. Institutional Interest and Collaborators (15 points out of 20)

High U.S. Institutional interest in this area of activities, since this is an exciting area with high potential payoffs.

Complementarity with Other USAID/India Programs (10 points out of 10)

Clearly compliments the Environment/Energy programs.

Potential Platform for More Collaborative/GDA-Type Mode of Operation (8 points out of 10)

Strong possibilities exist for collaboration with utility companies to share the costs of such reform endeavors.

Descriptive Template #9

Problem Area:	Water Scarcity
Proposed Intervention:	Improved On-Farm Water Management
Five-Year Objective:	Establish sustainable on-farm water management programs that can be replicated across the country with locale-specific modifications. Technical assistance will be provided by US and international research institutions. Success will be gauged by a combination of measures including: the extent of adaptation, associations formed, and measurable water/power saved. The intervention would initially tie in with Environment & Energy group's Water-Energy Nexus activity.
Rationale:	<p>This OFWM program closely complements the USAID/India Energy & Environment group's Water-Energy Nexus Activity. While the latter looks at water use from an energy-saving perspective, the former looks at it from the perspective of agriculture. Both are inexorably inter-linked by the fact that agriculture is a dominant user of energy for irrigation.⁹</p> <p>Water will probably be the limiting factor in future agricultural growth. Population growth and expansion of the system to meet food demands have placed additional pressures on the irrigated sector. Water is now a critical constraint for maintaining agricultural growth. Water related factors influencing agriculture include:</p>

⁹ Small-scale mechanization is rapidly expanding in much of the Indo-Gangetic basin. The impact of mechanization will clearly be positive from a productivity and water-use efficiency perspective. Mechanical cultivation and minimum tillage systems will favor crop diversification (particularly into legumes, oilseeds, vegetables, and other higher-value crops) after rice and during the winter season. The expanding use of raised beds during both the wet and dry season will lead to reduced water use on rice, with reduced methane production since flooding will be less important. Fertilizer use will also be more efficient in non-flooded conditions, reducing generation of greenhouse gasses. Advances in rainy-season rice will help make winter-season rice production less attractive, thus lessening water and power demand during peak load periods.

Joint efforts between the Indian national program, CIMMYT (the International Center for Maize and Wheat improvement) and IRRI (the International Rice Research Institute) offer excellent, near-term potential for promoting energy and water efficient production systems. These efforts would involve alliances with grass-roots farmer organizations and NGOs at the state and local levels. The complementarity of these efforts with an emphasis on greater production of legumes, maize, and vegetable crops is clear.

- The inefficient management of water with 60 percent of the water lost between distribution headworks and plants in the field;
- The poor working order of many facilities due to inadequate O&M;
- The overexploitation of groundwater leading to declining aquifer yields – primarily due to subsidized power for pump irrigation;
- Subsidized power for irrigation crippling the utility companies, endangering the sustainability of this service;
- Waterlogging and soil salinity, due to high distribution losses and poor drainage; and
- Low agricultural productivity due to outdated irrigation and agricultural technologies.

The private development of pump irrigation that led to the success of the green revolution is now contributing to the problems, as groundwater aquifers are treated as free resources with little effort made to balance inflow and outflow. In the past, on-farm water management (OFWM) projects funded by USAID and other donors focused on improving distribution channels. These programs helped reduce distribution losses, but they have not addressed the need to shift to more efficient irrigation technologies and water-saving production practices. Previously USAID-funded programs in agricultural research in the region have had a very high payoff. Given that new irrigation technologies will provide an opportunity for improved agricultural practices, another round of USAID development assistance in agricultural research should have a high return on the investment.

Improved on-farm water management has the potential to have an immediate impact on the poor by: helping them grow more on limited water resource, improve productivity in rain-fed areas, and organize themselves to reap the benefits of collective action.

Description:

This OFWM program will be implemented in conjunction with the ongoing Energy & Environment group's Water-Energy Nexus Activity. As appropriate, it would consist of the following interventions.

- New Irrigation Technologies: Even today, after all the improvements in agricultural technology stemming

from the green revolution, flood and basin irrigation is still quite prevalent. This system wastes large quantities of water and has led to waterlogging and salinity in vast areas. In addition, the water in the shallow aquifer becomes saline, deteriorating in quality. The next steps in improving OFWM and reducing irrigation losses are to introduce distribution systems such as buried pipe, flexible tubing, siphon tubes, and gated pipes. They can be combined with sprinkle, surge, and drip irrigation systems to maximize application efficiencies and minimize distribution losses. Instituting programs that help to shift irrigation from open ditches and flood irrigation to newer distribution and application systems is critical to maintaining the viability of the vast irrigated areas in the region.

- Agricultural Production Technologies: Improved OFWM will increase short-term costs in terms of inputs, time and effort. In order for farmers to recuperate these costs, new agricultural productivity enhancing technologies that are suited for these conditions will have to be adapted. Such technologies and production practices include: switching to crops that are drought tolerant or require less intensive irrigation, higher-value crops, improved seeds, increased levels/management of inputs, better water control, drip and sprinkler irrigation, watershed management, access to reasonable agricultural credit, and better marketing systems. Biotechnology also has potential contributions in this area. Also for consideration here is no-till agriculture.
- Water Management: Establishing suitable government regulations operating in tandem with functional user group associations is seen as necessary for successful sustainable water management. USAID can expect high payoff by helping the government draft legislation that would lead to successful groundwater aquifer management programs, and organize locally controlled groundwater management districts. In addition, a widespread program that introduces more efficient pump technologies will increase the profitability of pumped irrigation as well as reduce power demands associated with expansion of pump irrigation. Development assistance programs that demonstrate the value of local groundwater management and improved pump technologies would help to sustain the critical

aquifer resources, as well as have a positive return to farmers. Responding to the water crisis, certain areas have begun implementing irrigation management transfer (IMT) programs in order to ensure the systems are sustainable. IMT programs transfer responsibility for irrigation O&M to local management organizations, with government only responsible for delivery to the head of the distributary. Training farmer organizations and other forms of federated WUAs provides an opportunity for USAID assistance.

Potential US Partners: CGIAR centers, USDA and US land grant universities, and DFID sponsored development programs, the private sector involved in biotech & irrigation technologies

Potential Indian Partner(s): Local research centers, universities, extension system, NGOs, private & privatizing utility companies, farmer association, and other partners identified under the Water-Energy Nexus Activity.

Design Issues: Interventions are locale specific – weather, soil, culture.

Ensure that these new methodologies do not result in production losses due to unfamiliarity with the technology etc. – as this could end up being a public relations/demonstration nightmare.

Analytical Template #9**Problem Area:** Water Scarcity**Proposed Intervention:** Improved On-Farm Water Management**Total Score:** 86 points**Likelihood of Achieving Demonstrable Material Impact Within 5 years (13 points out of 20)**

Given that water shortage is being recognized as a crisis by the government and end-users, donor assistance in this area should lead to significant buy-in from the recipients leading high degree of success.

Significance of Impact on Lives of Low Income People, Particularly Women (14 points out of 20)

Women are increasingly carrying the burden of small-scale agriculture as the men leave the farm or engage in off-farm activities. Any loss in water quality/quantity is going to affect the poorest farmers disproportionately hard.

Potential for Cost-Effective Replication Across India (10 points out of 20)

If success can be demonstrated at a pilot level, neighboring communities are certain to adopt these new technologies without too much encouragement. For replication across the country, while some of these interventions will have commonalities, others will have to be tailored to suite the specific locale.

Strong Indian Institutional Interest and Collaborators (15 points out of 20)

Local institution should be receptive for collaboration. Funds spent of exchange of scholars type programs would strengthen collaboration.

Strong U.S. Institutional Interest and Collaborators (15 points out of 20)

U.S. universities, USDA etc. will be very interested in collaborating.

Complementarity with Other USAID/India Programs (10 points out of 10)

High complementarity with the Energy/Environment program.

Potential Platform for More Collaborative/GDA-Type Mode of Operation (10 points out of 10)

In South Asia, successful irrigation distribution and modernization programs have almost always been led by the private sector rather than by the government. Working with USAID assistance, the private sector is mature and has the capability to take the lead in this process.

Descriptive Template #10**Problem Area:** Water Scarcity**Proposed Intervention:** Water Markets and Inter-State Water Rights**Five-Year Objective:** (a) Establishment of formal water markets in select areas where clear problems exist, and where demand for workable solutions has been expressed by the local authorities and stakeholders. (b) For inter-state water rights, the objective is to lay the regulatory groundwork for negotiations and cooperation in this sensitive area.

At the local level, success will be determined by number of communities/municipalities that enact a regulatory framework for such markets to effectively function. At the state level, it will be measured by the initiatives made toward inter-state cooperation. The establishment of such a regulatory framework will also pave the way for other reform activities. Engage subject-matter specialist from U.S. government, state, educational and private institutions to collaborate with the relevant Indian officials. They would establish the regulatory framework and facilitate negotiations and implementation shared water resources between neighboring states.

Rationale: (a) Informal water markets - where water is sold by well owners to neighbors - is widespread and highly localized. These tend to be short-term customary transactions that function outside any formal framework of rights, laws or institutions. Informal water markets historically have enabled poor farmers to obtain water and helps the well-off farmers with the cost of maintaining a well. But, there is also evidence that they reinforce 'power accumulation'. Since informal water markets are unregulated, they lead to groundwater overdraft, and have no consideration for third party and environmental considerations. Regulated water markets are necessary re-allocating ground/surface water to high-priority uses.

(b) Agriculture accounts for an overwhelming share of water use. Higher demand (rural & urban) and inefficient use is increasingly placing pressure on limited water supplies. Mistrust and competition between states neighboring shared waterways leads to conflict and sub-optimal use of this precious resource. A regulatory

framework that lays the groundwork for negotiation and cooperation between these states would lead to valuing the water and sharing of water in a manner that captures its economic costs and leads to mutually beneficial gains. Once water is valued as a commodity, it will promote efficient use through: optimal cropping patterns, reductions in run-offs etc.

Activities in the area of water markets and inter-state water rights would complement the many programs of the World Bank, and other donors involved with irrigation and water management.

Regulated markets and orderly cooperation between states would reduce uncertainty over the availability, quantity, quality, price etc. of water. This is seen as providing long-term benefits to all farmers, including the poor (who tend to get squeezed out whenever there is competition over scarce resource).

Description:

USAID would fund a combination of short and long-term U.S. advisors to work on a pilot project in a select area where two or more states have conflict over common waterways. The location of the pilot would ensure that the states involved are reform minded with a perceived demand for such arrangements. Other donor activity in this area will also be considered so as to avoid duplication, and looking to build complementarily. In conjunction or separately, a pilot projects would be conducted to demonstrate workable water markets at the local level, with design emphasis placed on replicability.

Potential US partner(s):

Utah and Colorado State Universities, GOI and state officials

Potential Indian partner(s): State officials, governing bodies etc., WB and other donors

Design Issues:

Linking reforms in water markets with power pricing.
Coordinating judicial and regulatory functions.
Creating perception of unbiasedness while working between states.

Analytical Template #10**Problem Area:** Water Scarcity**Proposed Intervention:** Water Markets and Inter-State Water Rights**Total Score:** 57 points**Likelihood of Achieving Demonstrable Material Impact Within Five Years (5 points out of 20)**

These are interventions that clearly fall into the ‘high-risk/high-pay off’ category. Vested interests, state rivalries and farmer perceptions are obstacles to reforms. However, the recent state conflict over shared water in south India that had to be mediated by the courts illustrates the need for transparent regulation in this area, avoiding lengthy and costly arbitration.

Significance of Impact on Lives of Low Income People, Particularly Women (5 points out of 20)

In the long-run will have positive effects for the marginalized by reducing costs of water.

Potential for Cost-Effective Replication Across India (8 points out of 20)

Low potential for replication across the country. Institutional will for reform is necessary despite opposition from various interest groups. However, if a successful program is to be implemented, it will be valuable ammunition for officials pushing for reform across the country.

Strong Indian Institutional Interest and Collaborators (10 points out of 20)

Reformist minded Indian institutions – especially those with World Bank water management programs -- will be interested in exploring workable options in this area.

Strong U.S. Institutional Interest and Collaborators (15 points out of 20)

High U.S. Institutional interest in this area of activities, since this is an exciting area with high potential payoffs.

Complementarity with Other USAID/India Programs (8 points out of 10)

Water markets compliments the Environment/Energy program, and inter-state water rights compliments the Democracy & Governance program.

**Potential Platform for More Collaborative/GDA-Type (6 points out of 10)
Mode of Operation**

Uncertain at this stage.

ANNEX 2

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ANNEX 3

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